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1. INTRODUCTION

The University of Arizona is one of the top-ranked research universities in the United States, boasting very strong mining engineering and economic geology programs as well as top-ranked colleges of public health, medicine, law, business, social sciences, science, and engineering. The Mining and Geological Engineering Department (MGE) is at the forefront of research in the areas of mine management, feasibility studies, sustainable development, geomechanics, information technology, health and safety, industrial hygiene, mineral processing, extractive/hydro metallurgy, geo-sensing, neural networks, reservoir characterization, drilling, geophysics, and more. In addition, ours is the only university level program in the state providing education and research devoted to minerals engineering and the science and engineering of non-renewable resources and sustainability.

Mining has played a pivotal role in the success of the University of Arizona. In fact, the first building constructed at the university in 1888, “Old Main,” was built to house its School of Mines - the first in the state. Since then, we have fulfilled the land grant mission of the University by providing an engineering education focusing on the minerals industries. Our program has furthered technical education for development and extraction of non-renewable natural resources in the State of Arizona, and throughout the world. Those natural resources remain an important part of our state, national, and global economy. Since 1964, the Department has offered degrees in geological engineering with a particular emphasis on geomechanics and rock mass characterization for applications ranging from construction to oil, gas, and mineral development to environmental site characterization. More recently, the creation of the Lowell Mineral Institute in 2009 has proven to be the perfect complement to our existing courses of study, allowing for greater partnership with industry and important advances in the scientific, technological and educational aspects of mineral discovery, extraction and processing, and the concomitant environmental and societal issues.

Today, MGE offers a vast array of opportunities for study, leading to the Master of Engineering (MEng), the Master of Science (MS), and the Doctor of Philosophy (PhD). Students interested in health and safety careers can pursue a joint MS or MEng in MGE and a Master of Public Health. The Eller College of Management offers a dual degree program in which students can receive an MBA and an MEng degree. Three 15-unit graduate certificate programs are available with on-line courses in Rock Mechanics, Mine Health and Safety, and Mine Information and Production Technology. The MS is intended for students who want to study in a specialized area and to work closely with a faculty member on a unique research topic and complete an independent research project. The MS degree is the ideal entry point into a PhD program. Students planning to pursue a PhD are strongly encouraged to pursue the MS option. The Lowell Master of Engineering in Mineral Resources degree is structured like an executive MBA program with a combination of short courses, distance courses, professional projects, and networking with a cohort and industry mentors. The Post-Baccalaureate Certificate Programs, offered in Rock Mechanics, Mine Information and Production Technology and Mine Health and Safety, are intended as a continuing education mechanism for working professionals.

Detailed program requirements are described in later sections.

The purpose of this guide is to provide information on the requirements and procedures for pursuing a graduate degree or certificate in the Department of Mining and Geological Engineering at the University of Arizona.

Students are expected to be conversant with the Graduate College requirements and the Graduate Catalog. When in doubt about policies or procedures, you should check with the Graduate Degree Certification Office (http://grad.arizona.edu/). Changes in Graduate College guidelines and requirements supersede those found in this handbook; students should always consult with the Graduate College to ensure they are using current forms, deadlines, and requirements. This handbook is further intended to provide prospective applicants with information to
enable them to assess the opportunities for graduate studies in the MGE Department and to assist students in preparing for their programs of study.

It is recognized that the varied backgrounds, objectives, and needs of students may occasionally require interpretation of the guidelines. Under these circumstances, the student’s departmental program committee (usually comprising the student’s advisor and the faculty members in the student’s general area of study) may request a variance from the MGE Graduate Committee (a committee appointed by the department head). The MGE Graduate Committee must approve any changes in writing, and there must be a majority in favor of the changes.

Although this guide adequately describes the department requirements in most situations, there may be special circumstances that lead to uncertainties in the interpretation of the requirements. In this case, the student should consult an advisor. If there is disagreement with any interpretation made by the advisor, the appeal process is as follows: the MGE Graduate Committee can review an advisor’s decision and adjudicate the disagreements with a majority rules vote. Finally, the department head can review the committee’s decision, or refer the matter to the Graduate College. All decisions by the MGE Graduate Committee should be given in writing.
2. **FACULTY AND STAFF ROSTER**

The MGE Department is defined by its collaborative, innovative and student centered atmosphere: students, faculty and staff work together as a team, celebrate each other’s successes, with a focus on constructive collaboration and cooperation. Our research is inherently interdisciplinary and the depth and breadth of academic disciplines at the University of Arizona plays a pivotal role in the excellence in education and research offered at MGE. Normally your advisor will be a primary faculty member in MGE, but if your research leads you in a particular direction you can work with our joint and adjunct faculty as well. You and your advisors can partner with a variety of units, organizations, and government agencies including (but not limited to): the USGS, NIOSH, Mel and Enid Zuckerman College of Public Health, Eller College of Management, Rogers College of Law, College of Science, Institute for Mineral Resources, Institute for the Study of Planet Earth, Bureau of Applied Research in Anthropology, Udall Center for Public Policy, and so much more, making MGE a perfect fit for interdisciplinary scholarship.

![MGE FACULTY](image)

<table>
<thead>
<tr>
<th>Name</th>
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3. **WHO TO SEE FOR HELP**

A large research university can seem intimidating. You need good information to make good decisions and our faculty and staff are here to help make your graduate experience in MGE a success.

### 3.1 ACADEMIC ISSUES

In almost every circumstance, you should first pose questions on academic matters to your thesis or dissertation advisor. General questions about the Graduate College policies and procedures for obtaining degrees can also be answered by the MGE office staff. It is usually best to first inquire within the Department, before going to the Graduate College, as this may save you some time and effort. In addition, students must get acquainted with official procedures and deadlines set by the Graduate College. It is the student’s responsibility to know and comply with all the requirements set by the Graduate College. Please review carefully the Graduate College Web Site.

### 3.2 ADMINISTRATIVE ISSUES

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<tr>
<th>STAFF MEMBER</th>
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<td>Budgets</td>
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<td>Rachel Dyckman</td>
<td>Graduate program in MGE policies and procedures</td>
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<td>Angela Lester</td>
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<tr>
<td>David Streeter</td>
<td>Rock Mechanics Laboratory Set-Up and Safety Equipment</td>
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<td>IT Manager</td>
<td>Computer Hardware and Software</td>
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**CCIT**: University Computer and Email Accounts ([http://computing.arizona.edu/accounts](http://computing.arizona.edu/accounts))

### 3.3 MGE GRADUATE COMMITTEE

The members of the Graduate Committee are appointed each year by the Department Head. In some cases the Graduate Committee may be a committee of the whole or a subset of the department faculty.
4. ADMISSION

“Quality outcomes are produced by quality students.”

You might be surprised to realize that a large number of graduate students in MGE do not have undergraduate degrees in mining or geological engineering. The breadth of the fields we work in accommodate students from a wide range of backgrounds. The background coursework we look for is proficiency in calculus, physics, engineering science (statics and strength of materials), and a basic understanding of geologic principles. Our application acceptance process is competitive and we admit students we believe are dedicated to furthering their education, making a contribution to the profession, and able to meet the high academic standards of the university.

4.1 PROCESS AND REQUIREMENTS

The Application for Graduate Admission, application fee, Test of English as a Foreign Language (TOEFL) scores (as applicable), GRE exam (as applicable), and transcripts for all collegiate work completed with a CUM GPA USA equivalent of 3.0, should be submitted on line to the Graduate College (http://grad.arizona.edu/prospect/admissions.php). A copy of your Application for Graduate Admission, three letters of recommendation, statement of purpose (area of interest), and resume should also be sent directly to the MGE department (pdf via email is fine). The MGE Graduate Committee evaluates all of the application materials. The application materials are also routed to specific faculty members with whom the applicant has indicated an interest in working or who have an area of expertise relevant to the applicant’s statement of interest. The Committee will normally consider for admission an engineering or science applicant who has attained a B (3.0), or higher, grade average as an undergraduate at an accredited institution and who has a satisfactory GRE score. A student not meeting this GPA requirement, but who has demonstrated a progressive improvement in undergraduate grades, such that the grade average for the last two undergraduate years (approximately the last 60 course units) is B (3.0) or better and who has demonstrated promise through the GRE, may also be considered. While minimum GRE scores are not established for the department, competitive applicants are expected to have scores exceeding the 80 percentile in quantitative and 40 percentile in verbal.

For students who have been out of school an extended period, more emphasis will be placed on the GRE and/or professional accomplishments. Students in the MEng program or in a graduate certificate program do not have to take the GRE if they have a BS degree from a university recognized by the University of Arizona in a math, science, or engineering discipline or a relevant health, or business field and have completed most course pre-requisites in the proposed study program and meet the Graduate College GPA requirements. Ideally, students in a graduate certificate program or the MEng program will have a minimum of two years of professional work experience but this is not a requirement. Students may change from a MS to a MEng under certain circumstances with advisor approval but they must formally apply for the MEng program. Generally, students who have received research support in a MS program will not be allowed to change to a MEng program. Students may change from a MEng to a MS program but must apply for the MS program. Students wishing to change degree program from MS to PhD must first complete the MS degree and then apply for the PhD program through the regular admissions process.

Each of the six emphasis areas in the department has different requirements but in general to undertake graduate work in MGE, incoming students are expected to meet the following minimum requirements for background coursework:

1. Proficiency in mathematics with courses in Calculus as a base, (some graduate focus areas will require knowledge of differential equations).
2. Proficiency in calculus-based physics.
3. Proficiency in engineering science topics covering statics and strength of materials. For some graduate focus areas a course in fluid mechanics is required.

4. Proficiency in chemistry. For some graduate focus areas, more background in chemistry may be required.

5. Geoscience coursework or equivalent experience covering physical geology, basic mineralogy and petrology or an engineering geology course. For some graduate focus areas more background in geology may be required.

Upon admission, each graduate student will receive a written statement of course deficiencies from the Department. The student’s advisor may recommend additional background coursework as well. Any request for deviation from the above listed minimum requirements must be justified in writing to the Department Graduate Committee. These deficiencies may be removed by receiving credit for (pass/fail option is acceptable) courses specified by the advisor and Department Graduate Committee or receiving a waiver of the deficiency from the Department Graduate Committee.

If there is disagreement with the list of deficiencies the appeal process is as follows: the MGE Graduate Committee can review an advisor’s decision and adjudicate the disagreements with a majority rules vote. Finally, the department head can review the committee’s decision, or refer the matter to the Graduate College. All decisions by the MGE Graduate Committee should be given in writing.

Advancement to regular graduate status will not be considered until all deficiencies have been completed.

4.2 GRADUATE STATUS

Students with adequate undergraduate preparation who meet the minimum admission requirements are normally admitted with Regular Graduate Status. Without Regular Graduate Status, a student cannot receive an advanced degree from the MGE Department.

A graduate of a foreign institution may be admitted initially as an “international special student”. The departmental graduate committee will evaluate the record of any “international special student” at the end of the first semester in residence to decide if there are deficiency courses required of the foreign student in order to qualify for graduate standing. The student may enroll in this status for up to two semesters, with the understanding that they may be required to complete a number of units without earning graduate credit, to make up deficiencies. Students admitted to this status must enroll as a full-time graduate student taking a minimum of 9 units of credit each semester. At the conclusion of each semester, the Graduate Committee will evaluate the student’s progress. Subject to satisfying the GPA requirement of 3.0 in the UA graduate coursework and other defined requirements, the MGE Graduate Committee will recommend a change to Regular Graduate Status. The student can receive graduate credit for all graduate courses taken during the one semester immediately preceding the award of Regular Graduate Status. If the MGE Graduate Committee does not recommend a change to Regular Graduate Status after the second semester, the student will be removed from the degree program. It is the responsibility of the student to initiate the paperwork requesting conversion to Regular Graduate Degree Status.

Any student whose request for a change of status has been denied twice will not be allowed to graduate with an advanced degree from the MGE Department.

Students holding a Bachelor’s degree, or its equivalent, from a college or university, which grants degrees recognized by the University of Arizona may attend graduate-level courses without being admitted to a graduate degree program. Students who are on Non-degree Status (NDS) may enroll in graduate-level course work as their qualifications and performance permit. However, no more than 12 units earned while in this status may later be applied
toward an advanced degree awarded by the university. NDS students who later decide to pursue a graduate degree must follow the normal application process through the Graduate College.

4.3 FULL-TIME ENROLLMENT PROVISIONS

Students who are on a research or teaching assistantship must register for 12 units each semester (not including audit credits). These 12 units may be any combination of courses, independent study, thesis, or supplemental registration. Continuous Enrollment Policy requires that graduate degree seeking students be enrolled each academic semester from original matriculation to final degree completion. For continuous enrollment policy/leave of absence please refer to: http://grad.arizona.edu/academics/policies/enrollment-policies/continuous-enrollment

Half-time status is considered to be 5 – 8 graduate units (not including audit).

Doctoral students can enroll for 1 unit of 900 level credit until the degree is completed IF all of the following are met:

- Passed Comprehensive exam
- Completed 48-units of coursework and 18 units of dissertation
- Not needing to maintain fulltime student status to defer loan repayment (federal aid supported students with 1 unit of 900 will NOT be considered fulltime and will need to request a forbearance through the lending agency)
- Not on F1 or J1 visas
- Not receiving University support (except the Thesis/Dissertation waiver)

4.4 TRANSFER CREDIT

No more than 6 units of the required 24 course units may be transferred into the department from another accredited institution for the MS, or MEng degrees. A total of 3 units may be transferred into a certificate program. A limit of 6 units of graduate credit earned as an undergraduate senior can be applied to a graduate degree provided those units were not used to satisfy the undergraduate degree requirements. Only 12 units in graduate non-degree status can be applied for credit toward a master’s degree, if they were taken at the University of Arizona. See http://grad.arizona.edu/academics/policies/enrollment-policies/continuous-enrollment for details). The form for evaluation of transfer credit is available at Transfer Units Form – UAccess Student GradPath and must be completed before the end of the first semester in residence. Such transfer credit, as credit only, will be granted for graduate-level courses in which a grade of A or B (4.0 or 3.0) was earned. Such transfer credit becomes effective only after completion of 12 units of graduate course work at the University of Arizona, with a minimum grade average of B (3.0). For PhD students, up to 36 units may be transferred from an accredited university subject to approval by the faculty advisor, Graduate Committee, and Graduate College. These units must be in courses relevant to the PhD study program and must meet the requirements for the PhD program.
5. ADVISOR AND PROGRAM COMMITTEE

“You’re not flying solo.”

It takes a team to complete an advanced degree. That team includes your fellow graduate students, perhaps some undergraduate students, faculty from whom you take courses, your major professor or advisor, and your program committee. But you are the reason the team exists. It is up to you to use your team effectively and complete your degree requirements in a timely manner that also meets the standards of the university.

5.1 ADVISOR

Normally, the academic advisor and the “major professor” are the same individual. The student has the freedom to choose his or her advisor, subject to the acceptance of that faculty member and approval by the department head. A student who has accepted research or other support from their major professor and then wishes to change to another major professor must first get approval from the major professor who provided funding. A faculty member who wishes to employ the student of another faculty member should first contact the major professor of that student. It is the student’s responsibility to arrange an early appointment with the advisor to review course deficiencies and to organize a tentative study program. In conjunction with the advisor, the student will select a program committee, usually by the end of the first semester. The program committee must meet graduate college requirements for total number of faculty, faculty from the department, and faculty from the university (http://www.grad.arizona.edu). The student and program committee should review the proposed study program (usually by the end of the first semester or at the start of the second semester) and discuss the details of the degree requirements (e.g. paper, project, thesis topic, dissertation topic). All discussions and decisions made with respect to the student’s progress must be documented and a copy must be deposited in the student’s file.

5.2 PROGRAM COMMITTEE

The student should meet to discuss research plans, progress in courses, etc., with the program committee at least once per semester and more frequently with the advisor. It is expected that the student will meet more frequently with his or her advisor as the student progresses further in research. It is the student’s responsibility to arrange these regular meetings with the advisor and program committee. It is in the student’s best interests to be made aware of problems with their degree program as soon as possible. Students who do not make satisfactory progress on a research topic, project, or paper will not be allowed to continue solely on the basis of a minimally acceptable GPA. The criteria for acceptable progress for the MS and PhD degrees are listed in Appendix B. Likewise, a student may not continue more than two semesters with a GPA below 3.0, even if the student shows progress in research. It is primarily the advisor’s and program committee’s responsibility to guide the student in course work and research, and to inform the student when he or she is not making satisfactory progress. If the student disagrees with any decision made by the advisor and program committee, he or she can appeal the decision to the Department Graduate Committee, which can overrule the advisor’s decision (with a majority vote). Finally, the department head can review the Department Graduate Committee’s decision or refer it to the Graduate College.

A new advisor may be chosen by the student if the research topic turns out to be closer to another faculty member’s area of specialization. Both the old and the new advisors and the Department Graduate Committee should be informed in writing of the proposed change and agree to the change.
6. MASTER OF SCIENCE PROGRAM

The Master of Science program in the department is designed to increase a student’s ability to design and execute challenging professional assignments. The MS program is considered a practicing engineering degree and may require that certain pre-requisites and core courses be completed. The Master of Science degree is the preferred entry point to a PhD program.

A student who plans on completing degree requirements in time for a particular graduation date must submit a “Master’s Degree Plan of Study” to the Graduate Degree Certification Office approximately four months before that date. See the Graduate Certification deadlines for exact dates. Forms are available through UAccess Student GradPath. The student will submit the form online through GradPath, where it will be routed for approval by the advisor, and the Department Head. The completed notice contains the student’s study program, thesis title, and other information required by the Graduate College. In addition, each student must complete the outcomes assessment form and submit to the department at the time the Plan of Study is submitted to the department for review. The outcomes assessment document is an internal document for department graduate assessment and does not go to the graduate college. The form is available at http://mge.arizona.edu/graduate-program.

6.1 PLAN OF STUDY

The department requires a minimum of 24 units of graduate course credit (500 and above level courses) and the completion of a satisfactory thesis for which a maximum of 6 units of credit is awarded. The grade point average for all graduate course work must be 3.0 or above in order to graduate. The grades for course work used to fulfill this requirement must be an A or B. No more than 6 units of graduate work in courses which give P (pass) or S (superior) grades may be submitted for graduate credit, excluding 910 (thesis).

Each student should satisfy the following requirements in completing his or her 30 units for the master’s (thesis option) study program: (a) at least 18 units must be in courses for which A or B grades are given, (b) at least 15 units must be in the student’s major area as defined by the program committee. The major subject area is that group of courses centered on the thesis, project, or report, which improves the student’s background. The student’s advisor and program committee will define the major area, subject to approval by the Department Graduate Committee. It is recommended that students take at least 9 units of course work in the MGE Department not including thesis or report units. A draft of the plan of study should be submitted to the Department Graduate Committee by the registration date for graduate students of the second semester of study.

All work for the master’s degree must be completed within a 6 year period to receive credit. This includes transfer course work from other institutions. Unless a waiver is granted by the Graduate College, course work taken more than 10 years before completion, will not be accepted toward the 24-unit requirement for the master’s degree. The department will request a time-limit waiver only under exceptional circumstances.

Students in the MS degree program are required to register for and participate in the graduate seminar (MNE or GEN 696a) each semester they are in residence. One unit of seminar credit is applied toward the program of study. The seminar series is designed to build camaraderie, promote professional communication, provide experience in critiquing and giving a professional presentation, and develop networking skills.

Students in the MS degree program are required to give one public technical talk either at a conference or the department seminar.
6.2 THESIS

The department requires students in the Master of Science to write, and defend, a thesis. The department makes this requirement because designing a research program, carrying it out, and presenting the results are essential parts of a professional engineer’s duties. The student may wish to examine theses written by former students, which are in the department library, in order to obtain a better idea of the scope and format of a thesis or report.

The requirement for a Master’s thesis in this department is an original contribution to the field, which can include but is not limited to collection of data, analysis of existing data sets, creation of computer programs, or development of new procedures, policies, or methodologies. Ideally, the thesis should result in one peer-reviewed journal publication. Each graduate student is advised to read "A Manual for Theses and Dissertations", which is available at https://grad.arizona.edu/gcforms/sites/gcforms/files/page/thesisdissertationsubmissionmanual.pdf.

Theses and reports must be edited for style, grammar, and logical organization prior to being submitted to the advisor and program committee. It is the student’s responsibility to ensure that the draft submitted to the advisor is in well-written, standard English. Writing advice is available through various sources on campus and also from professional editors which are hired at the student’s expense.

The normal sequence of events for submitting a thesis or report is:

1. Submit a professional written and edited draft to the advisor
2. Once the advisor has reviewed the draft, the student must make all required revisions
3. The revised draft is sent to the program committee for review
4. The program committee reviews the draft and requests revisions
5. The draft can be approved for defense by the program committee or the program committee can require review of another draft prior to the defense
6. Once the program committee and advisor have approved the draft, a defense is scheduled.

An electronic version of the thesis or report should be submitted to the department in addition to a bound paper copy on thesis quality paper. The electronic version (in .pdf format) may be posted on the department website at the discretion of the advisor and program committee. If the full thesis or report is not published on the website, at a minimum the student’s name, title of thesis/report and abstract will be published. Publication of the thesis or report is strongly encouraged and the student should make a commitment to conduct scholarly work at a level that is satisfactory for publication in a journal or scientific conference.

6.3 FINAL EXAMINATION

Each candidate for a master’s degree in the department must pass an oral final examination. The examination will cover the thesis or report and will also include questions to test the student’s competence in the subjects presented in his or her study program. The student should plan on an examination of approximately two hours. The student will make a presentation of the thesis or report. In addition to the examining committee of at least three faculty members, other members of the University staff, interested professionals from outside the University and students may be invited to sit in on the thesis defense, as nonvoting participants. The timing of the final examination is critical only if the student wishes to participate in a particular graduation ceremony. The final examination should be scheduled approximately one month before the intended graduation date. Students will schedule the final examination with the Front Office to reserve a room. See the Graduate Degree Certification Deadlines for the exact dates. The student is required to fill out a form entitled "Master’s/Specialist Completion of Degree Requirements" before appearing for his or her examination. This form allows the student to make minor changes in the thesis title.
or course offerings subject to approval by the student’s advisor. When scheduling the final examination, the student should also allow enough time to make agreed changes in the thesis in order to submit the approved thesis to the Department approximately fifteen days prior to graduation. See the Graduate Degree Certification Deadlines for the exact dates. After making any required corrections, three unbound copies of the approved thesis and the abstract must be submitted to the Department to meet the approximately 15-day graduation deadline.

Any student who fails the final examination may, upon recommendation of the major department and approval of the University Graduate Council, be granted a second examination after a lapse of at least one semester. A representative of the Graduate Council must be present at the second final examination. The examining committee should be the same as those who were present at the first examination attempt, unless a waiver is granted by the Department Head.
7. **MASTER OF ENGINEERING PROGRAM**

The Master of Engineering (MENG) program is primarily intended for working professionals, and while it is not a terminal degree, students considering entering a PhD program in the future should choose the MS program. The program requires an undergraduate degree in an engineering discipline or a related science, health, or business discipline. Prerequisites in calculus, physics, and chemistry must be satisfied prior to applying to the program. Prerequisites in engineering science and geology should be taken prior to applying, and in some circumstances students will be allowed to take a few remaining prerequisites in their first semester. Students with a BS degree in an engineering, math, or science discipline, qualified business or health disciplines, and a cumulative GPA of 3.0 at the undergraduate level do not have to take the GRE to enter the MENG program. Graduates of non-US institutions will have to meet the university requirements for admission (http://grad.arizona.edu/admissions). The MENG program does not have a residency requirement and most courses will be offered on-line so a student in a foreign country may not be required to obtain a US entry visa. International students interested in the MENG program should consult the proper authorities regarding visa requirements. There is an additional cost for distance courses taken in the MGE Department (this applies to the MENG, MS and PhD programs). Also, it should be noted that courses taken outside the Mining and Geological Engineering department may not be offered at a distance.

The MEng program is designed to be very flexible and to accommodate practicing engineers who are taking courses primarily from web or video sources at the UA, ASU, or NAU. Students in an MENG program will form a program committee similar to a MS program committee and must submit a program of study and report outline to the program committee for approval. Students in the MEng program must write and present a professional report for up to 3 units of credit. Students in the MEng program may also take up to 6 units of independent study provided the independent project has a plan approved by the advisor in advance and the project is well documented prior to submission of a grade. Students in the MEng program are not restricted from receiving funding to support their report work.

The MENG program consists of the following requirements:

<table>
<thead>
<tr>
<th>Course Category</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering / Science / Business courses in primary areas of focus</td>
<td>20-24 units</td>
</tr>
<tr>
<td>Engineering math</td>
<td>3 units</td>
</tr>
<tr>
<td>Business / Engineering Management</td>
<td>3 units</td>
</tr>
<tr>
<td>Capstone Seminar (required)</td>
<td>0-1 unit</td>
</tr>
<tr>
<td>Project (optional)</td>
<td>3 units</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>30 units</strong></td>
</tr>
</tbody>
</table>

Students in an MENG program will form a program committee similar to a MS program committee and must submit a program of study to the program committee for approval. Students are required to give a capstone seminar, either to the committee (0 units) or as part of the MNE 696A course (1 unit). Students in the MENG program may conduct and write-up a professional project for 3 units of credit. Students in the MENG program are not restricted from receiving funding to support their project work. A minimum of 15 units of graded coursework must be from the College of Engineering. A maximum of 6 units can be transferred from another university.
The J. David Lowell Master of Engineering in Mineral Resources is an option within the MENG program. It is intended for mineral resource professionals advancing to management positions and for those from other disciplines who are entering the mineral resources industry and need professional career preparation specific to the industry. The program consists of distance-based courses that run the duration of a semester and intensive short courses that run from 2-3 days to 2 weeks. Students are required to select at least 9 units of coursework from a predefined emphasis area. In addition, they are required to take 3 units of engineering focused mathematics related to their program of study and 3 units of coursework in business or management. Short courses may be used as part of the required emphasis units or electives. A minimum of 15 units of graded coursework must be in mining engineering. Students pursuing the MENG degree via this curricular track can take up to 6 units of project and work-related independent study units spread over at least 2 semesters if they are employed in the industry. Students who are not employed in the industry should take 27-30 units of graded course work and no more than 3 units of independent study or project. Students will have an advisory committee that must approve the plan of study, independent studies, and project. Courses from one of the three certificate programs in mining engineering from the University of Arizona will transfer into the Master of Engineering in Mineral Resources degree.

The Master of Engineering in Mineral Resources program consists of the following requirements:

<table>
<thead>
<tr>
<th>Required courses</th>
<th>9 units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electives</td>
<td>3-12 units</td>
</tr>
<tr>
<td>Engineering math</td>
<td>3 units</td>
</tr>
<tr>
<td>Business fundamentals</td>
<td>3-9 units</td>
</tr>
<tr>
<td>Project or Independent Studies (over at least 2 semesters)</td>
<td>0-6 units</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>30 units</strong></td>
</tr>
</tbody>
</table>

Students must select one emphasis area and take at least 9CH from that area and 3-12CH of elective courses from one or more of the areas listed below. Additionally, all MENG candidates must enroll in one unit of MNE 696A.

- **Mine Information and Production Technology (9CH)** MNE 507 Equipment Operations Technology (web), MNE 509 Management Operations Technology (web); MNE 696b Modern Mining Operations Systems; MNE 587 Applied Neural Network Computing (web); MNE 519 Mine Planning Software (short course); MNE 534 Surface Mine Design (web); MNE 538 Underground Mine Design (web); SIE 554A The Systems Engineering Process (web); SIE 531 Simulation Modeling and Analysis (web); SIE 548 Operations Research Modeling (web);

- **Mine Health and Safety (9CH)** MNE 526 Health and Safety in Mining (web), MNE 521 Disease and Illness in Mining (web); MNE 576 Fundamentals of Mine Ventilation; CPH 553 Toxicology and Chemical Exposures (web); CPH 522 Safety Fundamentals (web); CPH 576a Biostatistics (web) (may be used to satisfy math requirement); CPH 577 Social and Behavioral Aspects of Public Health (web); CPH 574 Health Administration and Policy (web); CPH 575 Environmental and Occupational Health (web); CPH 573a Basic Principles of Epidemiology (web);

- **Geomechanics (9CH)** MNE 527 Geomechanics (web); MNE 547 Underground Construction Geomechanics (web); MNE 580 The Mechanics of Failure in Rock and Other Brittle Materials (web); MNE 515 Rock Excavation (web); CE 540 Soils Foundation Engineering; CE 541 Earth Structures (web);
• Mineral Processing (9CH) MNE 511 Mineral Processing (web); MNE 541 Surface Chemistry of Flotation (web), MNE 5xx Surface Chemistry Measurements

• Sustainable Resource Development (9CH) MNE 522 Engineering Sustainable Development (web); MNE 541 Environmental Management and Mine Reclamation (web); ABE 526 Soil and Water Conservation Engineering; AREC 576 Natural Resource Law and Economics

• Mine Management (Business fundamentals 3-9CH) MNE 530 Mine Examination and Valuation; MNE 696c Introduction to Engineering Contract Law (short course); MNE 696x Leadership for Engineers and Scientists (short course); MNE 696x (short courses) Mineral Economics Concepts, Mine Finance, Introduction to Financial Institutions, Modern Corporate Organizations in the Minerals Industry, International Minerals Trade, Innovation Process; Short courses in economic geology as offered by UA Geosciences; Electives (3-12CH)

Electives (3-12CH) Students must complete 3-12CH of elective coursework. These courses are subject to the approval of the advisory committee. Short courses may be used as elective credit.

Engineering Math (3CH) Students must complete 3CH of a mathematically focused course. Graduate courses in engineering math, probability and statistics, or numerical modeling are recommended. Examples of math intensive classes include MNE 527, 587, 547, 580; CPH 576a.

Business Fundamentals (3-9CH) Students must complete a minimum of 3CH of coursework in fundamental business topics, law, and personnel management. Possible topics include: contract law, personnel management, mineral economics, mine finance, corporate organizational structure, financial institutions, and innovation. Short courses may be used to satisfy this requirement.

Final Report and Independent Studies (0-6CH) Students who are employed in the minerals industry or closely related field may take up to 6 units of project and independent study, spread over at least 2 semesters. The project and independent study must be appropriate to the student’s plan of study, and is subject to the approval, in advance, of the student’s advisory committee.
8. **CERTIFICATE PROGRAMS**

The Post-Baccalaureate Graduate Certificate program consists of 15 units of focused course work in: Rock Mechanics; Mine Health and Safety; Mineral Processing; and Mine Information and Production Technology. Students wishing to complete a certificate will select a faculty advisor who is involved in administering the courses for an established certificate program. Minimum admissions requirements and minimum pre-requisites for the certificate program are similar to the Master of Engineering (details on each certificate are in Appendix C). Students with an MS or PhD may also enter the certificate program provided the certificate program is not part of their prior study areas.
The doctoral program is designed to prepare a professional engineer for senior responsibility in industry, research, or teaching. The successful candidate must demonstrate the ability to devise and execute a program of study and research, which makes a fundamentally new contribution to the chosen field. The most important aspect of the doctoral program is the dissertation, which is the evidence of this fundamental contribution. The student should be prepared for an often lengthy and certainly very demanding period of study beyond the master’s degree. The PhD dissertation must disclose:

1. The development of new techniques, principles, or theories;
2. The use of old established techniques, principles, or theories in a new and/or unique manner; and/or
3. The use of new information and the discovery of new findings if it is described in terms of an original model or process.
4. It should also lead to at least one significant paper published in a reviewed journal at the discretion of the advisor and program committee.

A collection of facts and information, no matter how carefully organized or described, does not by itself constitute a PhD dissertation. A PhD dissertation research program will often make use of the contributions from a faculty advisor and others, but it should be clear exactly what creative contribution the PhD candidate has made to the research.

9.1 RESIDENCE AND COURSE REQUIREMENTS

The minimum time to complete a doctoral program is six semesters, two of which must be as a full-time resident in the department. To be considered as a semester of full-time residency, a student must register for and complete at least 9 units of graduate course work or research.

Students who are on a research or teaching assistantship must register for 12 units each semester. These 12 units may be any combination of courses, independent study, thesis, or supplemental registration.

All requirements for the degree must be completed within five years of passing the comprehensive exam. If a student does not finish within this time period the comprehensive exam can be retaken with permission from the Department Graduate Committee and the advisor. At least 12 of the minimum 66 units of graduate credit required must be completed at this University for a grade of A or B. Students must complete 18 units of dissertation credit. No more than 16 units of graduate credit may be taken during any given semester of full-time residency. A minimum of 36 units of graduate level courses, exclusive of dissertation or thesis units, must be in the major subject area. The major subject area is that group of courses centered on the dissertation, which improves the student’s background for eventual preparation of the dissertation. No more than 15 units of graduate work in courses which give P (Pass) or S (Superior) grades may be submitted for graduate credit, excluding MNE920 dissertation. Course and thesis work completed as part of an accredited master’s program may be counted as part of the 66 unit minimum, if they fall within the major subject area. No more than 6 units of credit toward the doctorate will be granted for the master’s thesis if the thesis was submitted to the University of Arizona. Master’s theses from other institutions are accepted only with the approval of the student’s advisor and the Department Graduate Committee. One or two minor subject areas, typically comprising a total of at least 12 units of course work as specified by the minor department(s), are required. The minor subject area is selected to provide additional background information pertinent to the preparation of the dissertation.
The department requires 6 units of graded credit in computer-intensive, mathematics-intensive, and/or statistics-intensive courses. These courses include geostatistics, and courses in SIE, signal and image processing in ECE, and inverse theory in GEOS. These courses must be identified in the planned course of study and approved by the advisor and Department Graduate Committee (see the Foreign Language Requirement section below).

<table>
<thead>
<tr>
<th>MINIMUM COURSE REQUIREMENTS</th>
<th>NORMALLY MET BY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 units</td>
<td>24 units</td>
</tr>
<tr>
<td></td>
<td>(from master’s degree in major area)</td>
</tr>
<tr>
<td>12 units (minor area/s)</td>
<td>12 units (major area)</td>
</tr>
<tr>
<td>18 units (dissertation)</td>
<td>18 units (dissertation)</td>
</tr>
<tr>
<td><strong>66 units TOTAL</strong></td>
<td><strong>66 units TOTAL</strong></td>
</tr>
</tbody>
</table>

The doctoral student will commonly complete more than the 66-unit minimum requirement. The student will find it very difficult to satisfy the need to know and understand the subject within the minimal requirements. The student’s advisor may also specify additional course requirements as necessary to insure the student’s understanding of the relevant subject matter. Not all of the additional courses need to be included on the formal doctoral study program. Of those included, at least one half must be in courses for which A or B grades are given. Students should take care to select 66 units that fulfill these requirements. Furthermore, the student must maintain a B (3.0) or better overall average in graduate courses, with a minimum B (3.0) average in the major area. Failure to maintain the required grade average is grounds for probation and eventual dismissal, at the discretion of the student’s graduate committee.

Students in the PhD degree program are required to register for and participate in the graduate seminar (MNE or GEN 696a) each semester they are in residence. Two units of seminar credit are applied toward the program of study. The seminar series is designed to build camaraderie, promote professional communication, provide experience in critiquing and giving a professional presentation, and develop networking skills.

Students are required to give two public technical talks or department seminar presentations prior to the defense of their dissertation.

**9.2 QUALIFYING EXAMINATION**

Students seeking the doctoral degree in the MGE Department may be required to take and pass a qualifying examination in the proposed field, in order to demonstrate capability to undertake work leading to the doctorate. The qualifying exam is designed to test fundamental concepts and the student’s analytical and reasoning capability. The qualifying exam is administered after the first year of coursework is completed and before the end of the third semester of coursework. Students must formerly request a waiver of the qualifying exam based on performance in coursework and progress toward their plan of study. The waiver must be approved by the advisor and the Department Graduate Committee. Should the student perform poorly at the qualifying examination, the examination committee reserves the right to recommend the student for academic disqualification based on lack of preparation. The student has the right to appeal the decision to the department’s graduate committee.
9.3 STUDY PROGRAM

A formal program of study together with an outline of the proposed dissertation should be formulated between the second and the third semester in residence. This coursework should be listed on the “Doctoral Plan of Study” form, which is available through UAccess Student GradPath. At this stage, the student should have picked his or her major advisor and the minor advisor and program committee. If the student’s advisors, program committee and the MGE Graduate Committee approve the program, it is then submitted to the Graduate Degree Certification Office for consideration.

9.4 FOREIGN LANGUAGE REQUIREMENT

The department does not have a foreign language requirement. However, because of the increasingly international nature of the field, the department recommends that students give serious consideration to developing communication skills in a foreign language other than their native tongue or English.

Instead of the foreign language requirement, the department requires 6 units of graded credit in computer-intensive, mathematics-intensive, and/or statistics-intensive courses. These courses must be identified in the plan of study and approved by the advisor, program committee, and Department Graduate Committee.

9.5 THE COMPREHENSIVE EXAMINATION

After completing the study-program course work, the doctoral student must schedule a comprehensive examination in both the major and minor fields, usually at the end of the second year of graduate work. The initial part of the examination is written. An oral examination follows a successful written examination. The form entitled “Application for Oral Comprehensive Examination for Doctoral Candidacy” should be submitted to the Graduate Degree Certification Office at least 3 weeks before the date of the oral exam. The comprehensive examination committee is normally composed of three faculty members selected from the faculty of the major department and one faculty member from the student’s minor field. A specially qualified professional from outside the University may serve as a full member of this committee. The Dean of the Graduate College makes the formal appointment of the committee, after receipt of the “Application for Oral Comprehensive Examination for Doctoral Candidacy” request from the major and minor department heads.

The written part of the examination prepared by the department may be either an open-book or a closed-book test, depending upon the desires of the individual faculty. The committee members from other departments will apply their own procedures. The purpose of the test is to assess how the doctoral student reasons while determining the breadth of knowledge in the student’s chosen field. The oral exam is closed to the public.

The oral examination may cover any topic listed in the study program, or basic to that program. This examination is intended to test the student’s comprehensive knowledge of the major and minor subjects of study, both in breadth across the general field of study, and in depth within the area of specialization. Normally, the Oral Exam will also include a discussion of the student’s proposed dissertation topic. The student should be prepared to present a brief summary of the dissertation proposal during the oral exam. The written and the oral must be taken within a 6-month period. If more than 6 months pass before the oral, the student must submit a petition to take the oral exam. The program committee must recommend or reject “Advancement to Candidacy” after the comprehensive examination is complete. The doctoral candidate may schedule the “final examination and dissertation defense” for any time three months after his or her “Advancement to Candidacy”. If the student fails the compre-
9.6 DISSERTATION AND DEFENSE

Usually the work on the PhD dissertation will require full-time effort from the candidate during the final year or two. For guidelines on the preparation of the dissertation, see "A Manual for Theses and Dissertations", available online at the Graduate College’s website. Three weeks prior to the date of the final examination, the candidate must submit the form entitled “Announcement of Final Oral Examination” to the Graduate Degree Certification Office. The student must arrange an acceptable date and time for the program committee to make its final examination and hear the student’s defense of the dissertation. All three of the major study area members of the program committee must be present at the final examination. Attendance by the committee members from the minor field is not required, but they must be invited and are entitled to vote, if present. Again, two negative votes will fail the candidate. The final examination, the time and place of which is to be announced at least one week in advance, is open to the public. All interested faculty and students may attend the final examination, which represents the culmination of considerable effort on the part of the candidate.

9.7 DISSERTATION IN ABSENTIA

Under certain circumstances, the student may prepare part of the dissertation in absentia. Permission must be granted through formal petition for in-absentia work before such work commences. Before in-absentia work can be approved, the dissertation must be well defined, the literature search and background study well developed, and a suitable plan for liaison prepared. Adequate supervision of the student’s work must be maintained, and, on field-oriented problems, provision must be made to have the faculty advisor, or representative, visit the area to review the problem and the student’s work. To request in-absentia status, the student must complete a petition form, outlining why such status is requested and demonstrating that the guidelines for in-absentia status have been met. The request will be reviewed by the Department Graduate Committee, who may recommend for approval, for denial, or for conditional approval. In the last instance, examples of additional conditions which may be required are completion of analytical work in residence, preparation of a rough draft in residence, or return to residence status for the semester preceding graduation. Any student using University of Arizona facilities or services (e.g. library, faculty advisor, dissertation defense, etc.) must be registered. The student must maintain continuous registration status each semester until all degree requirements are met.

9.8 DEPOSIT OF MATERIALS IN DEPARTMENT ARCHIVES

The student must carefully organize and file in the department all supporting material for the dissertation. This may include rock samples, maps, data, computer programs, copies of personal communications that are referenced in the dissertation, etc. As with any rigorous scientific work, it must be possible to duplicate the student’s experiment, verify the data, computer programs, or theoretical developments. In general, the use of proprietary data, computer codes, or techniques which cannot be placed in the public domain for scientific scrutiny are incompatible with the goals of the dissertation. Exceptions can be made, when necessary, by the Department Graduate Committee. In addition to a bound print copy, an electronic version of the dissertation in .pdf format must also be submitted to the department and may be posted on the department website at the discretion of the advisor. If the full dissertation is not posted to the website, at a minimum, the student’s name, dissertation title, and abstract will be posted.
10. OUTCOMES AND ASSESSMENT

10.1 OVERVIEW

The MGE Department is active in research in the general areas of geomechanics, information technology, mine management, feasibility studies, sustainable development, industrial hygiene, health and safety, mineral processing, extractive/hydro metallurgy, geosensing, geophysics, data mining, rock breakage, and more.

The Department of Mining and Geological Engineering offers opportunities for study leading to the Post-Baccalaureate Certificate, Master of Engineering (MEng), the Master of Science (MS), the Doctor of Philosophy (PhD). Students interested in health and safety careers can pursue a joint MS or MEng in MGE and a Master of Public Health. The Eller College of Management offers a dual degree program in which students can receive an MBA and a MEng degree. The MS is intended for students who want to study in a specialized area and to work closely with a faculty member on a unique research topic and complete an independent research project. The MS degree is the ideal entry point into a PhD program. Students planning to pursue a PhD are strongly encouraged to pursue the MS option. The MEng option is intended for the student desiring a broader background, those working in industry who need to obtain continuing education in an engineering topic, and those who need a distance-delivered degree option. The Professional Certificate Programs are intended as a continuing education mechanism for working professionals as well as students in related degree programs already enrolled at the University of Arizona.

All Master-level degrees are 30 units. The PhD requires 66 units. The professional certificate programs are 15 units.

The outcomes listed below represent the minimum skill set a student completing a post-baccalaureate program should have by the end of their studies. Individual advisors may have additional requirements. Interpretation of how a particular outcome is satisfied is up to the student and their advisor. Outcomes are not formal course requirements unless specified as such elsewhere in this document. Measurement of outcomes is used to assess how well a particular graduate program meets its stated goals and helps focus areas for improvement. The outcomes are not a measure of student performance.

10.2 OUTCOMES

Upon completion of a professional certificate program, the graduate will be able to:
- Possess a deeper knowledge from a baccalaureate degree of a sub-discipline within the general areas covered by the department
- Have a sufficient mathematical and computer background to formulate and solve practical problems in the discipline
- Access, analyze, and utilize available information from a variety of sources
- Use competencies associated with critical thinking and problem solving
- Demonstrate life-long learning skills
- Possess an awareness of engineering ethics
- Demonstrate a commitment to the advancement of the profession

Upon completion of a MEng degree, the graduate will be able to:
- Possess a thorough knowledge of a sub-discipline within the general areas covered by the department
- Formulate and solve practical problems in the discipline
- Access, analyze, and utilize available information from a variety of sources
- Use competencies associated with critical thinking and problem solving
• Demonstrate the ability to communicate with a professional audience both orally and in writing.
• Possess a basic knowledge of business and/or socio-economic principles that impact the profession
• Demonstrate the ability to influence others
• Demonstrate life-long learning skills
• Possess an awareness of engineering ethics
• Demonstrate a commitment to the advancement of the profession

Upon completion of a MS degree, the graduate will be able to:
• Possess a thorough knowledge of engineering principles in sub-disciplines related to the department
• Possess a basic knowledge of business and/or socio-economic principles that impact the profession
• Formulate and solve practical problems in the discipline
• Access, analyze, and utilize available information from a variety of sources
• Use competencies associated with critical thinking and problem solving
• Demonstrate the ability to formulate and conduct a research project
• Demonstrate the ability to communicate the results of a research project both orally and in writing.
• Demonstrate the ability to influence others
• Demonstrate the ability to work effectively on a team
• Demonstrate life-long learning skills
• Possess an awareness of ethics in engineering research
• Demonstrate a commitment to the advancement of the profession
• Be able to assess and present an engineering problem and solution in relation to societal issues

Upon completion of a PhD degree, the graduate will in addition to the above be able to:
• Demonstrate the ability to devise and execute a program of study and research, which makes a fundamentally new contribution to the chosen field through one or more of the following means:
  – The development of new techniques, principles, or theories;
  – The use of old established techniques, principles, or theories in a new and/or unique manner; and/or
  – The use of new information and the discovery of new findings if it is described in terms of an original model or process.
• Demonstrate quality of scholarship through the publication at least one significant paper in a reviewed journal at the discretion of the advisor and program committee.

10.3 MEASUREMENT OF OUTCOMES

Each student must submit an outcomes assessment to the MGE Department prior to the award of their degree or certificate. Forms are available on the MGE website (http://mge.arizona.edu/graduate-program).
<table>
<thead>
<tr>
<th><strong>DEGREE</strong></th>
<th><strong>OUTCOME</strong></th>
<th><strong>MEASURE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate</td>
<td>Knowledge in the discipline beyond BS degree</td>
<td>Grades in graduate courses</td>
</tr>
<tr>
<td></td>
<td>Sufficient math and computer background</td>
<td>Grades in math and computer intensive courses</td>
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<td></td>
<td>Access and use information from a variety of sources</td>
<td>Completion of projects within courses</td>
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<tr>
<td></td>
<td>Critical thinking and problem solving skills</td>
<td>Completion of projects and design problems within courses</td>
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<td></td>
<td>Life-long learning</td>
<td>Grades in distance delivered courses</td>
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<tr>
<td></td>
<td>Possess an awareness of engineering ethics</td>
<td>Completion of an ethics module in a course or seminar or read an engineering ethics book</td>
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<tr>
<td></td>
<td>Demonstrate a commitment to the advancement of the profession</td>
<td>Membership in SME or other technical professional society</td>
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<tr>
<td>MEng</td>
<td>Communicate with a professional audience</td>
<td>Quality of oral presentation and written report</td>
</tr>
<tr>
<td><em>(all of the above plus)</em></td>
<td>Ability to influence others</td>
<td>Persuasiveness of oral presentation and written report</td>
</tr>
<tr>
<td></td>
<td>Possess a basic knowledge of business and/or socio-economic principles that impact the profession</td>
<td>Complete a business-emphasis course or related topic</td>
</tr>
<tr>
<td>MS</td>
<td>Be able to assess and present an engineering problem and solution in relation to societal issues</td>
<td>Exposure to sustainable development or related topic, or work on a project with a societal component</td>
</tr>
<tr>
<td><em>(all of the above plus)</em></td>
<td>Formulate and conduct a research project</td>
<td>Completion of a thesis</td>
</tr>
<tr>
<td></td>
<td>Work effectively in a team</td>
<td>Assessment of teamwork from program committee or advisor</td>
</tr>
<tr>
<td>PhD</td>
<td>Make an original contribution to the field</td>
<td>Completion of dissertation</td>
</tr>
<tr>
<td><em>(all of the above plus)</em></td>
<td>Quality scholarship</td>
<td>Reviewed publications</td>
</tr>
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</table>
11. GRADUATE COLLEGE FORMS, GUIDELINES, AND LINKS

We recommend using the Graduate College website so that you will have the most up-to-date guidelines, forms and policies. Almost all of the Graduate College forms you will fill out are found through your UAccess Student GradPath.

- Graduate College – [www.grad.arizona.edu](http://www.grad.arizona.edu)
- Deadlines - [http://registrar.arizona.edu/schedules/dates.htm](http://registrar.arizona.edu/schedules/dates.htm)
- Financial Support - [http://grad.arizona.edu/financial-resources](http://grad.arizona.edu/financial-resources)
- Online Application for Admission - [http://www.grad.arizona.edu/admissions/apply-now](http://www.grad.arizona.edu/admissions/apply-now)
- Theses & Dissertations Manual – PDF document is available [here](http://www.grad.arizona.edu/admissions/apply-now)
12. **TIMETABLE FOR GRADUATE DEGREE COMPLETION**

12.1 **MASTER’S LEVEL**

1. First semester of residence: meet with advisor, form program committee, draft plan of study, verify plan for completion of deficiencies.

2. Second semester of residence: submit plan of study to Department Graduate Committee for approval, outline thesis or report topic and distribute to advisor and program committee, submit plan of study and thesis title to Graduate College, continue coursework/research, meet with program committee to review progress.

3. Third semester (as needed): continue with coursework/research; meet with program committee to review progress upon advisor recommendation.

4. Fourth semester through end of program (as needed): continue with coursework/research; meet with program committee to review progress. Have thesis or report reviewed by outside editor for proper English before submitting to advisor for review, submit to program committee for review, schedule defense after draft thesis or report has been reviewed and approved by program committee.

12.2 **PhD LEVEL**

1. First semester of residence: meet with advisor, form program committee, draft plan of study.

2. Second semester of residence: continue coursework/research, meet with program committee to review progress, prepare the qualifying examination (or apply for waiver from Department Graduate Committee with advisor approval).

3. Third semester of residence: continue with coursework/research, meet with program committee to review progress, finalize plan of study and submit to Department Graduate Committee.

4. Fourth semester of residence: continue with coursework/research, meet with program committee to review progress, meet with advisor to discuss scheduling of comprehensive exams.

5. Fifth semester: schedule comprehensive exams, meet with program committee at discretion of advisor, and keep program committee updated on progress.

6. Sixth semester until completion: complete research, meet regularly with advisor and keep program committee updated on progress, have dissertation reviewed by outside editor for proper English before submitting to advisor for review, submit to program committee for review, schedule defense after draft dissertation has been reviewed and approved by program committee.
APPENDIX A: BENEFITS FOR GRADUATE STUDENTS

GRADUATE ASSISTANTSHIP/ASSOCIATESHIP GUIDELINES

REQUIREMENTS:

- Be a student and enrolled in a graduate degree program at the University of Arizona.
- Have an admitting GPA of 3.0 or higher if a new student or maintain a 3.0 cumulative GPA for all University of Arizona graduate credit courses.
- Graduate Associates must in addition to the above be enrolled in a doctoral degree program with either a master’s degree or 30 units of doctoral work at the UA.
- Retain associate status unless converted to a non-doctoral degree program as a Graduate Assistant or change hiring departments.

EMPLOYMENT STATUS AND LIMITATIONS:

- Limited to no more than 30 hours per week in total campus employment during periods of enrollment to maintain student employee status. Employment for International Students on F-1 or J-1 visas must be limited to 20 hours per week while school is in session. This is a federal regulation.
- Exempt from deductions for Social Security taxes during semesters or summer session when officially enrolled. Minimum enrollment for the exemption is six units per semester for Fall/Spring or three units per summer session.

ENROLLMENT LIMITATIONS - ACADEMIC YEAR: FALL & SPRING SEMESTER

Minimum enrollment: GAs are required to enroll for a minimum of twelve (12) units of graduate credit each semester. Undergraduate and/or officially audited graduate courses are NOT included in this total.

Minimum Training Requirements:

- **GATO:** All GA’s who will have direct instructional contact with students are required to FULLY participate in a one-day Graduate Assistants/Associates Teaching Orientation which is presented by The University Teaching Center and The Graduate College. Students who have previously completed the GATO need not attend again.

- **Departmental Orientation:** GA’s are also required to attend a minimum of eight hours of departmental training. This is to cover specific information relevant to the individual department and the course(s) to be taught.

- **TOEFL:** All GA’s whose native language is not English and who do not have a degree from a U.S. institution must have a minimum score of 550 (paper-based test) or 213 (computer-based test) on the Test of English as a Foreign Language before their appointment as a GA.

- **TSE:** All GA’s engaged in direct student contact whose native language is NOT English and who are NOT citizens of the U.S. or Permanent Residents must demonstrate proficiency with spoken English.
BENEFITS FOR GRADUATE ASSISTANTS/ASSOCIATES

- **Tuition Remission:** Eligible for partial payment of their standard in-state tuition. Remission amount is dependent on FTE. GA’s appointed at half time or greater will receive a 60% remission and those appointed at less than half-time receive a 49.1% remission. This benefit is not available for summer sessions.

- **Nonresident Tuition Waiver:** All GA’s who are not residents of the State of Arizona receive a nonresident tuition waiver.

- **ASUA Bookstore Discount:** 10% discount at all ASUA Bookstores, with a valid CAT card.

- **Payroll Deduction Plan:** Can elect to have their remaining portion of their in-state tuition (registration fees) deducted directly from paychecks.

- **Student Health Insurance:** Individual health insurance coverage will be paid by the U of A. To be eligible for this benefit you must have signed the Notice of Appointment, be registered, and have ordered the insurance coverage through Student Link.

GRADUATE COLLEGE FELLOWSHIPS

Beginning with the academic year 2012-13 ALL graduate students who are awarded Graduate College Fellowships from the academic units MUST show a level of need before receiving the funds. The new guideline is in addition to the ongoing requirements of degree seeking, enrolled in 3 units or more, in good academic standing, and a 3.0 or higher GPA. Need is calculated on the previous year’s income which may change from year to year.

To demonstrate a level of need:

- Domestic Students must file the Free Application for Federal Student Aid (FAFSA) BEFORE any funds will be disbursed. You may locate the FAFSA information through UAccess Student under Student Center Services, under the financial aid tab at the far right (as shown on page 2 of this announcement).

- International Students must submit the Financial Aid Calculation for International Students in Masters / Doctoral Programs to the academic unit’s graduate coordinator who will forward it to the Office of Student Financial Aid (OSFA) for review at OSFA-DeptAskAid@email.arizona.edu. This is BEFORE any funds will be disbursed. This is the ONLY document source to show need and will be electronically housed within OSFA and not on UAccess. Please note that it is the last page of this document that must be filed.

Please be sure that you read your Notice of Appointment completely. There are requirements that need to be met. If a student resigns or terminates prior to the end of the assistantship he/she will be held responsible for payments of tuition and a premium for the remaining insurance coverage.
APPENDIX B: SATISFACTORY PROGRESS GUIDELINES

Per March 3, 2004 Graduate College memo, “In addition to meeting Graduate College Rules for Satisfactory Academic Progress, students must also adhere to [the MGE guidelines] for satisfactory academic progress.”

“When a student fails to meet program guidelines for satisfactory progress, the student must receive written notification with a clear statement of what the student must do and a date by which such actions must be completed. The Graduate College should receive copy of letters of unsatisfactory progress. Students must be given an opportunity to appeal or rebut, and program guidelines must indicate a process for appeals. Students who fail to remediate by the deadlines specified may be dismissed from the program. Students have the right to appeal such decisions to the Graduate College, but the Graduate College will limit its review to whether or not the program followed their established policies.”

The following timetables represent the minimum progress a MGE graduate student must maintain to avoid being disqualified. Full-time students in serious pursuit of a graduate degree should use a timetable of two years to complete a thesis-option MS degree and three more years to complete a PhD.

| MS Degree       | Year 1                     | Full-time student   | • Complete any existing deficiencies or complete at least 12 units of non-pass/fail, non-seminar courses for program of study.  
|                 |                           | Part-time student   | • Identify thesis topic and committee.  
|                 | Year 2                    | Full-time student   | • Complete at least 6 units of non-pass/fail, non-seminar courses for program of study  
| MS Degree (con’t) | Year 2                  | Part-time student   | • Complete remaining coursework  
|                 | Optional Year 3           | Full-time student   | • Pursue thesis or report research  
|                 | Optional Year 4           | Part-time student   | • File for degree  
|                 | Year 3                   | Part-time student   | • Complete remaining coursework  
|                 |                          |                    | • Pursue thesis or report research  
|                 |                          |                    | • File for degree  
|                 |                          |                    | • Finish thesis or report research and defend  
|                 |                          |                    | • Finish thesis or report research and defend  


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<thead>
<tr>
<th>PhD Degree</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
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<tbody>
<tr>
<td></td>
<td>Complete existing deficiencies or complete at least 12 units of non-pass/fail, non-seminar courses for program of study</td>
<td>Complete existing deficiencies or complete at least 12 units of non-pass/fail, non-seminar courses for program of study</td>
<td>Complete remaining coursework</td>
<td>Complete research and write dissertation</td>
</tr>
<tr>
<td></td>
<td>Identify research area and advisor</td>
<td>Identify comprehensive exam committee</td>
<td>Pass written and oral comprehensive exams</td>
<td>Select final exam committee</td>
</tr>
<tr>
<td></td>
<td>Identify minor</td>
<td></td>
<td>File for application to candidacy</td>
<td>Pass final exam</td>
</tr>
<tr>
<td></td>
<td>Pass qualifying exam by end of year 1</td>
<td></td>
<td>Pursue doctoral research</td>
<td>Submit final copy of dissertation</td>
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</table>
APPENDIX C: CERTIFICATE PROGRAM DETAILS

GENERAL DESCRIPTIONS

Degree program affiliation: Applicants are not required to enter another degree program and the continuation of this certificate program is not contingent on continuation of other degree programs. Students who have successfully completed this certificate may transfer all units into the Master of Science, or Master of Engineering degree programs in mining engineering or Master of Public Health.

Fee Schedule: We propose using the same fee schedule as for the Master of Engineering program. Course substitutions or changes in electives are allowed with the approval of the MGE faculty member in charge of the selected track.

Teaching Methodology: All courses in this certificate program will be offered on-line, or as video courses.

Student Admittance/Advising/Completion: Student must have no less than a bachelor’s degree for a post-baccalaureate certificate or be currently enrolled in a graduate level program.

Admissions requirements: Enrollment is limited to graduates of accredited engineering bachelors program and other cognate degrees (i.e., biology, chemistry, geology, industrial hygiene, physics, etc.) with a 3.0 GPA or higher. Applicants must be able to demonstrate that they have the necessary prerequisites completed for the courses in the certificate program. To be admitted to this certificate program, candidates should have two years of progressively responsible professional experience, preferably in the specific option selected for study.

Concurrent Enrollment: Concurrent enrollment is allowed but not required in other degree programs (Professional Master of Science, Master of Engineering, Master of Public Health, Master of Business Administration, etc.)

University Credit Requirement: At least twelve credits must be taken at the University.

Transfer credit: 3 units may be transferred into the certificate.

Student advising: Faculty responsible for each certificate program will advise students in that program.

Transfer to a Degree Program: Students in good academic standing at the conclusion of the certificate may transfer all the credits into the Masters of Engineering, or Masters of Science in Mining Engineering with full credit for graduate classes taken. (The MS and PhD programs are titled Mining, Geological and Geophysical Engineering but for the sake of brevity are simply called mining engineering in this document).

Student Learning Outcomes: At the conclusion of the certificate program students should:

- Possess a deeper knowledge from a baccalaureate degree of occupational safety and health within the general areas covered by the mineral resources industry and/or geological engineering
- Have sufficient mathematical and computer background to formulate and solve practical problems in the discipline.
- Be able to access, analyze and utilize available information from a variety of sources and use competencies associated critical thinking and problem solving.
- Demonstrate life-long learning skills.
- Possess an awareness of engineering ethics.
- Demonstrate a commitment to the advancement of the profession.
Certificate name and description:

POST-BACCALAUREATE CERTIFICATE IN MINING OCCUPATIONAL SAFETY AND HEALTH

Description: Graduates of the Post-Baccalaureate Certificate in Mining Occupational Safety and Health will be better prepared to achieve certification as mine safety professionals and can advance on to Master of Science, Master of Engineering or Master of Public Health programs. To qualify for this certificate program, applicants must have a Bachelor’s degree in engineering or related science or health field and must meet the course pre-requisites for the courses in the certificate.

Curriculum: 15 units of credit beyond the Bachelors of Science in Mining Engineering or a related degree in engineering, science, or health profession.

The Mine Health and Safety certificate option will consist of three required classes:

- MNE 576 Mine Ventilation (3 units of lectures, no laboratory)
- MNE 526 Mine Health and Safety (1 unit)
- CPH 553 Toxicology and Chemical Exposures (3 units)

The elective courses are:
- CPH 522 Safety Fundamentals (3 units)
- CPH 576A Biostatistics (3 units)
- MNE 521 Disease and Illness in Mining (3 units)
- MGE 527 Geomechanics (3 units of lectures, no laboratory)
- MNE 547 Underground Construction Geomechanics (3 units)
- CPH 574 Health Administration and Policy (3 units)
- CPH 575 Environmental and Occupational Health (3 units)
- CPH 573A Basic Principles of Epidemiology (3 units)
- CPH 577 Social and Behavioral Aspects of Public Health (3 units)
**Certificate name and description:**

**POST-BACCALAUREATE CERTIFICATE IN MINE PRODUCTION AND INFORMATION TECHNOLOGY**

**Description:** Graduates of the Post-Baccalaureate Certificate in Mine Production and Information Technology will better understand how information technology can be used to maximize mine production and can advance on to Master of Science, or Master of Engineering programs. To qualify for this certificate program, applicants must have a Bachelor’s degree in engineering or related science and must meet the course pre-requisites for the courses in the certificate.

**Curriculum:** 15 units of credit beyond the Bachelors of Science in Mining Engineering or a related degree in engineering, science, or business profession.

The Mine Technology certificate option will consist of three required classes:

- MNE 507  Equipment Operations Technology (3 units)
- MNE 509  Management Operations Technology (3 units)
- SIE 554A  The Systems Engineering Process (3 units)

The elective classes are:

- MNE 587  Applied Neural Network Computing (3 units)
- SIE 531  Simulation Modeling & Analysis (3 units)
- SIE 530  Engineering Statistics (3 units)
- SIE 548  Operations Research Modeling (3 units)

Course substitutions or changes in electives are allowed with the approval of the MGE faculty member in charge of the selected track.
**Certificate name and description:**

**POST-BACCALAUREATE CERTIFICATE IN GEOMECHANICS**

**Description:** Graduates of the Post-Baccalaureate Certificate in Geomechanics will be better prepared to understand complex issue in rock mass behaviors and can advance on to Master of Science and/or Master of Engineering programs. To qualify for this certificate program, applicants must have a Bachelor’s degree in engineering or related science and must meet the course pre-requisites for the courses in the certificate.

**Description of the Curriculum:** 15 units of credit beyond the Bachelors of Science in Mining Engineering or a related degree in engineering or science profession.

The Geomechanics certificate option will consist of four required classes:

- MNE 527 Geomechanics (3 units of lectures, no laboratory)
- MNE 580 Rock Fracture Mechanics (3 units)
- MNE 547 Underground Construction Geomechanics (3 units)
- MNE 515 Rock Excavation (3 units)

Electives are:

- CE 540 Foundation Engineering (3 units)
- CE 541 Earth Structures in Geotechnical Engineering (3 units)
- MNE 576 Mine Ventilation (3 units of lectures, no laboratory)
- MNE 909 Independent Study (1-3 units)

Course substitutions or changes in electives are allowed with the approval of the MGE faculty member in charge of the selected track.
Certificate name and description:
POST-BACCALAUREATE CERTIFICATE IN MINERAL PROCESSING

Description: Graduates of the Post-Baccalaureate Certificate in Mineral Processing will focus on physical and chemical unit operations used to separate and recover the economic minerals and metals from their ores. Graduates can advance on to Master of Science and/or Master of Engineering programs. To qualify for this certificate program, applicants must have a Bachelor’s degree in engineering or related science and must meet the course pre-requisites for the courses in the certificate.

Description of the Curriculum: 15 units of credit beyond the Bachelors of Science in Mining Engineering or a related degree in engineering or science profession.

The Mineral Processing certificate option will consist of four required classes:
• MNE 511 Mineral Processing (3 units)
• MNE 539 Surface Chemistry of Flotation (3 units)
• MNE 550 Elements of Solution Mining (3 units)
• MNE 565 Hydrometallurgy (3 unit)

Electives are:
• CHEE 500R Water Chemistry for Engineers (3 units)
• CHEM 529 Methods of Surface and Materials Analysis (3 units)

Course substitutions or changes in electives are allowed with the approval of the MGE faculty member in charge of the selected track.
These rules are for the safety and protection of people and equipment in the lab areas. Please read and follow them.

1. Wear proper foot protection in the lab areas. Steel-toed shoes are best, but good street shoes are acceptable. Students wearing open-toed shoes WILL NOT be allowed to work in any of the labs.

2. Wear safety glasses or goggles when grinding, cutting, or drilling.

3. Wear safety gloves and use hand truck when lifting and handling heavy, cumbersome, or sharp-edged pieces of rock, steel, etc.

4. Smoking is not permitted anywhere in the building.

5. Know how to use the equipment BEFORE you use it. If you have any questions, please ask the Lab technician who can instruct you on how to operate the equipment.

6. Rooms 119, 29 and 31 are generally open M-F, 8:00 to 5:00. You may work at night, or weekends, with permission, only if you work with a partner. Please plan your testing accordingly.

7. Please keep the lab areas and equipment clean. The janitors only remove trash and may occasionally sweep the floor. Most cleaning, especially of equipment, must be done by personnel actually doing the preparation and testing of samples. Cleaning up will be greatly appreciated.

8. Always work in a group of at least two people, and under no circumstances run any of the equipment when you are alone in the room.

9. All personnel must read and sign: “MGE GEOMECHANICS LABORATORY USAGE POLICY AND THE 2010 LABORATORY SYLLABUS” before they will be allowed to operate any lab equipment.

BASIC SHOP RULES - issued by University of Arizona Risk Management Services are posted in all work areas.