I. Certificate name and description: Post-Baccalaureate Certificate in Rock Mechanics

Description: Graduates of the Post-Baccalaureate Certificate in Rock Mechanics will be better prepared to understand complex issues in rock mass behavior and can advance on to Master of Science and/or Master of Engineering programs. To qualify for this certificate, 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.

Managing college and department: College of Engineering, Department of Mining and Geological Engineering

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.

Business plan: All of the courses proposed for this certificate program currently exist and will be on-line by fall 2006. No new resources are required to offer this certificate. We have capacity for 12 additional students in the courses proposed for this certificate. Courses in this program currently meet or slightly exceed minimum enrollment at the undergraduate and graduate levels.

II. Certificate Requirements

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

The Rock Mechanics certificate option will consist of four required classes
MNE 527 Geomechanics 3-4 units
MNE 580 Mechanics of Fractures in Rocks and other Brittle Material 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

Course substitutions or changes in electives are allowed with the approval of the MGE faculty member in charge of the selected track.

Integration with Current Programs: This certificate is linked to our existing MS and MEng programs. No new courses are needed.
Teaching Methodology: All courses in this certificate program will be offered on-line, or as video courses.

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

- Possess a deeper knowledge from a baccalaureate degree of rock mechanics 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.
- Access, analyze and utilize available information from a variety of sources.
- 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

III Student Admission/Advising/Completion – Student must have no less than a bachelor’s degree for a post-baccalaureate, a master’s degree for a Post-Master’s certificate or be currently enrolled in a graduate level program.

Prerequisites or standardized tests required: No standardized tests required.

Admissions requirements: Enrollment is limited to graduates of accredited engineering bachelors program and other cognate degrees (e.g. Physics, chemistry, geology, 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 (Master of Science, Master of Engineering, 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: MGE faculty will advise students upon entering the certificate program and at the beginning of each academic year a student is enrolled in the program.

Transfer to a Degree Program: Students in good academic standing at the conclusion of the certificate may transfer all graduate credits into the Masters of Engineering, or Masters of Science in Mining Engineering with full credit for 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).
IV. Certificate and Student Outcomes

Provide a plan and frequency for assessing the intended certificate outcomes both for students and the certificate.

The certificate program will be assessed based on student feedback and enrollment.

Students will be surveyed upon completion of the certificate program to assess the appropriateness of the material presented to the student. Students will be asked to provide feedback on the relevance of the material presented, degree of difficulty and length of the course. The students will be surveyed a second time, three years after completion of the certificate program, to determine if the material presented was still relevant to the student’s professional responsibilities and provided a platform to further advance the student in their professional career.

The certificate program will be assessed based on student enrollment. It is anticipated that enrollment will initially be low and build over time. Initial enrollment is anticipated to be four to six students. As the program becomes familiar to those in the industry and additional classes are made available, the program should increase in enrollment. After five years of continuous operation, enrollment should be eight to twelve students per year. If the enrollment targets are not met or exceeded, significant changes to the certificate program should be considered, including termination.

V. Is there sufficient student demand for the certificate?

Anticipated student enrollment: 4 initially; 12 maximum

Collaboration with other departments: Department of Civil Engineering

Program demand/need:

The certificate in mining engineering is a specialized study in rock mechanics. A key element of safety in any mine, whether it is surface or underground, is the stability of the rock structure in which the mine is operating. A mine is likened to a factory that is always under construction. As miners work to remove the earth containing mineralized ores, the stresses in the rock and hence stability of the mine itself is continually changing. These changes can be rapid and difficult to detect because rock masses contain faults, fractures, joints and other anomalies internal to the rock. Rock mechanics is the science dealing with the design of structures in rock. The certificate in mining engineering with the geomechanics option will focus specifically on developing an in-depth understanding of the science of rock mechanics.

The global mineral resources industry is facing a severe shortage of engineers. With an assumption of only 0-5% annual growth in the industry the industry is short 500% of the necessary mineral engineers; with a more realistic growth of 5-10% the industry is short 600%. The shortage is driven in part by increased consumption of raw materials in the developing nations and also by the demographics of the industry. The majority of the engineers is over the age of 50 and is expected to retire in five to ten years. Hence there is
demand for continuing education and post-baccalaureate education for working professionals changing their duties within companies or those who do not have a strong enough background in a particular segment of the industry and therefore need more education.

VI. Expected Faculty and Resource Requirements

The following faculty member will lead this certificate program:

1) John Kemery, PhD.

Additional faculty needed: The hiring of one other new faculty member is pending. It is expected that any new faculty member will participate in this certificate program. No new faculty beyond the pending hire is required.

Present FTE students and Faculty:
Current FTE students: 40 undergraduates; 24 graduates (MS, PhD)
Current FTE faculty: 5

Future FTE students and Faculty (anticipated by fall 2007):
Future FTE students: 80 undergraduates 45 graduates (MS, PhD)
Future FTE faculty: 6

VII. Supporting letters from the college dean and department head have been submitted. Dr. Juan Velaza, Head of Civil Engineering and Engineering Mechanics has approved the participation of CEE/M in this program.