Explosives Engineering Graduate Options

Explosives Engineering Certificate

This certificate program is designed to provide formalized education in the area of Explosives Engineering. Students will be exposed to the theoretical and practical approaches of explosives engineering. Students will learn analysis and design of explosive-related systems and both natural and built structure effects. The Explosives Engineering Certificate Program is open to all persons holding a B.S., M.S., or Ph.D. degree in engineering, physical science or technology, who meet S&T graduate requirements and who have a minimum of 12-months of post-B.S. professional employment experience. The certificate is designed for the professional who does not have the time to take the GRE. Professional experience and maturity are often assessed and may be used to compliment the applicants undergraduate GPA. Once admitted to the program, the student must take four designated courses as given below. In order to receive a Graduate Certificate, the student must have an average cumulative grade of 3.0 or better in the certificate courses. Students admitted to the certificate program will have non-matriculated status; however, if they complete the four-course sequence with a grade of B or better in each of the courses taken, they will be admitted to the M.S. Explosives Engineering program. The certificate credits taken by students admitted to the M.S. program will count toward their master's degrees. Students who do not have all of the prerequisite courses necessary to take the course in the certificate program will be allowed to take "bridge" courses at either the graduate or undergraduate level to prepare for the formal certificate courses. For further qualification information see “graduate program entrance, acceptance requirements & procedures” on the next page.

The following courses are required:

- Two Required Courses:
  - Exp Eng 5612: Principles of Explosives Engineering
  - Exp Eng 5622: Blasting Design and Technology
- Two additional courses from an approved list maintained by the explosives engineering program faculty.

Explosives Technology Certificate

The Explosives Technology Certificate is designed for non-engineering graduates whereas the Explosives Engineering Certificate is designed for engineering graduates.

The Explosives Technology Certificate Program is open to all graduates holding a B.A., or advanced higher degree that have a mathematics background through trigonometry (Missouri S&T Math 6 or equivalent) and a minimum of 12-months of post-B.A. professional employment experience.

The student must have a cumulative GPA of 3.0 or higher in the four courses (12 credits) required for this graduate certificate. Students admitted to a graduate certificate program will have non-degree student status, but will earn graduate credit for the courses they complete. If the four-course sequence is completed with a grade of B or better in each of the courses taken, the student, upon application, will be admitted to the M.S. degree in Explosives Engineering, but will be precluded from taking any graduate courses until successful completion of the following pre-requisite courses:

1. S&T Chem 1310 General Chemistry 1 (or equivalent)
2. S&T Chem 1319 General Chemistry 1 Lab (or equivalent)
3. S&T Chem 1100 Lab Safety (or equivalent)
4. S&T Math 1214 Calculus for Engineers 1 (or equivalent)
5. S&T Math 1215 Calculus for Engineers 2 (or equivalent)
6. S&T Physics 1135 Engineering Physics 1 (or equivalent)
7. S&T Mech Eng 2340 Statics and Dynamics (or equivalent)

The certificate courses taken by students admitted to the M.S. program will apply toward their master's degrees. Once admitted to a certificate program, a student will be given three years to complete the program so long as he or she maintains at least a B average in the courses taken. The applicant must also pass a background check.

The following courses constitute the graduate certificate in Explosives Technology:

- Required – One of the following four courses:
  - Exp Eng 5612: Principles of Explosives Engineering
  - Exp Eng 5711: Explosives in Industry
  - Exp Eng 5721: Specialty Uses of Energetic Materials
  - Exp Eng 5914: Explosives Manufacturing

- Choose an additional three courses from those listed above or the list below:
  - Exp Eng 5112: Explosives Handling and Safety
  - Exp Eng 5512: Commercial Pyrotechnics Operations
  - Exp Eng 5513: Stage Pyrotechnics and Special Effects
  - Exp Eng 5514: Display Fireworks Manufacturing
  - Exp Eng 5555: Computer Fired Pyrotechnic Show Design & Firing System Operation
  - Exp Eng 5622: Blasting Design and Technology
  - Exp Eng 5713: Demolition of Buildings and Structures
  - Exp Eng 5922: Advanced Tunneling & Underground Construction Techniques
  - Exp Eng 6112: Explosives Regulations
  - Exp Eng 6112: Regulatory Issues in the Explosives Industry

Other courses approved by the explosives engineering faculty may be substituted for any of the above listed courses on a case-by-case basis.

Explosives Engineering Minor

A student who receives a Masters or Ph.D. degree in an accredited engineering program from Missouri S&T may receive the Minor in Explosives Engineering by completing 15 credit hours from the courses listed below. Non-engineering students who have a strong background in mathematics and the physical sciences may also qualify for the Minor in Explosives Engineering, with the approval of the Department and based on an individually designed program of study. Students need to consult with the Chair of the Mining Engineering Program to determine pre-requisite requirements for each course. The program granting the graduate degree shall determine whether or not courses taken for the Explosives Engineering Minor may also be used to fulfill the requirements of the graduate degree from that program.
The following courses are required for the Minor in Explosives Engineering:
Exp Eng 5612/307 - Principles of Explosives Engineering
Exp Eng 5622/350 - Blasting Design and Technology
Plus three other explosives related courses as approved by program coordinator

Explosives Engineering Master of Science (MS)

By Thesis
Students will be required to meet the standard graduate school admission requirements for Missouri S&T. Additionally; the Explosives Engineering M.S. is considered a specialist qualification for graduates holding accredited engineering, physical science and technology B.S. degrees. Students meeting admission requirements must be approved by the appropriate department chair or designate as well as the office for Graduate Studies. The program requirements follow on from the postgraduate explosives engineering certificate. Graduates are expected to complete 24 credit hours of coursework (including 6 hours of 6000+ level lecture classes) along with 6 hours of explosives engineering research and to successfully complete a thesis describing his/her research. A complete list of explosives courses is listed in the Graduate Catalog.

- Required – Four of the following six courses:
  - Exp Eng 5612: Principles of Explosives Engineering
  - Exp Eng 5622: Blasting Design and Technology
  - Exp Eng 5713: Demolition of Buildings and Structures
  - Exp Eng 5922: Advanced Tunneling and Underground Construction
  - Exp Eng 6312: Scientific Instrumentation for Explosives Testing and Blasting
  - Exp Eng 6412: Environmental Controls for Blasting

Non Thesis Option
The 6 hrs of research are replaced by two additional explosive courses (an industry project or graduate co-operative experience can count as one of these two additional courses). 9 hours of 6000+ level lecture classes are required.

Explosives Technology Master of Science (MS)

Non Thesis

This degree was designed primarily for distance students who are interested in gaining an advanced degree in Explosives and have already earned an Explosives Technology Graduate Certificate. Students will be required to meet the standard graduate school admission requirements for Missouri S&T. This degree is different from the MS in Explosives Engineering since it does not require the prerequisite courses to be taken by a student who has successfully completed the Explosives Technology Certificate. The program requirements follow on from the postgraduate Explosives Technology Certificate. Graduates are expected to complete 30 hours of coursework (an additional 18 if the E.T. Grad Certificate already completed) with a minimum 9 hours of 6000+ lecture classes. The Explosives Technology MS requires the following:

Four of the following core classes (some credits may have already been earned in the E.T. Grad Certificate and will count toward this requirement):

- Exp Eng 5612
- Exp Eng 5622
- Exp Eng 5711
- Exp Eng 5713
- Exp Eng 5721
- Exp Eng 5914
- Exp Eng 5922
- Exp Eng 6112

The remaining 18 hours are up to the student's discretion but a minimum of 9 hours of the 30 must be 6000+ lecture courses.

Thesis

Candidates may choose to include 6 hours of research to replace a 3 hours 5000+ lecture course and a 3 hours 6000+ lecture course in order to write a thesis. However, the non-thesis option is encouraged for distance students.

Explosives Engineering Doctor of Philosophy (PhD)

The Explosives Engineering PhD comprises a minimum of 72 credit hours. Students must work with their advisor/committee to ensure the proper courses are being taken for their research area.

For students with an MS, 30 hours are credited toward the PhD leaving 42 hours remaining. A minimum of 12 lecture course hours and a minimum 24 research hours are required with 6 additional hours that can be at the discretion of the student and advisor.

Students without an MS requires them to complete a minimum of 30 lecture course hours and 30 research hours. The remaining 12 hours can be at the discretion of the student and advisor.

The student is required to complete a substantial thesis describing his/her research which may or may not include published papers depending on the advisor and committee.

Last updated 17 April 2023

Graduate Program Entrance, Acceptance Requirements & Procedures

Entrance Requirements

For the postgraduate explosives **engineering** program a Bachelors of Science degree in engineering, technology or a physical science is required. This is to ensure that the student already possesses basic engineering skills. The BS transcript is examined for the successful completion of the following classes (S&T numbers or equivalent):

Chem 1310	General Chemistry I	4
Chem 1319	General Chemistry I Lab	1
Chem 1100	Lab Safety	1
Math 1214	Calculus I	4
Math 1215	Calculus II	4
Physics 1135	Physics I	4
And one or more of the following:		
Civ Eng 2200	Statics	3
Mech Eng 2340	Statics and Dynamics	3
Mech Eng 2519	Thermodynamics	3
Mech Eng 2527	Thermal Analysis	3
Civ Eng 3330	Fluid Mechanics	3

If these classes or their equivalents are not present the applicant will be required to take which ever classes are deficient.
If the applicant does not have a BS and meet the above requirements (for example a BA) he/she will be required to take and successfully pass the above classes before their application will be considered.

The university also has regulations on the required GPA of the applicant for admission to graduate school. For a postgraduate degree or certification that may lead into a graduate degree a GPA of 3.0 is required for regular admission. The GPA may be the cumulative GPA or the last 60 hrs of the BS program. For a GPA between 3.0 and 2.75 an applicant may be admitted as a probationary student. For experienced applicants who have a significant duration of work experience post baccalaureate, their experience and accomplishments may be assessed by the explosives faculty and taken into consideration for applicants with a lower GPA. We know that students often mature after graduation and gain valuable skills related to work experience. Often a probationary student will first be admitted to the certificate program. Satisfactorily completing a certificate is an alternate route into the masters and is often used by distance students who do not have the time to study for and take the GRE exam.
Further information may be found in the graduate catalog on the registrar's website at
http://catalog.mst.edu/graduate/admissionsandacademicprogramprocedures/#text

The PhD program has a direct route from the BS degree if the applicant has a GPA of 3.5 or above. Otherwise the Masters must be successfully completed first.

Procedures

On receipt by admissions of your application for the explosives engineering postgraduate program it will be checked for completeness and then passed on to the department where the explosives engineering faculty will review the application and make their recommendation. The recommendation then goes to the department chair for consideration it then is passed on to the S&T graduate office where the staff check the application meets S&T standards and the vice provost for graduate studies then makes the final determination. If the vice provost determines that further action needs to be taken before approval it may be sent back to the department for reassessment and/or further documentation. The time taken for the application process is determined by the quality of the application, the timing of the submission and the availability of faculty and staff. Sometimes everything is in perfect alignment and the process quite rapid but other times there may be problems or everything is out of synchronization with faculty out of town or on vacation and it may take an extended period.