EXPLOSIVES ENGINEERING

Minor in Explosives Engineering

The department of mining & explosives engineering, mining engineering program, realizing the attractiveness of explosives engineering to students, the potential for jobs in the area (post 9-11), and the use of over 6 billion pounds of explosives in mining, tunneling, construction, and other areas, is offering a minor in explosives engineering so that students interested in explosives engineering have a chance to attain in-depth knowledge of the sub-discipline.

A student who received a bachelor of science 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 explosives engineering program to determine pre-requisite requirements for each course. The program granting the bachelor of science degree shall determine whether or not courses taken for the explosives engineering minor may also be used to fulfill the requirements of the B.S. degree from that program.

The following courses are required for the minor in explosives engineering:

EXP ENG 5612/ MIN ENG 5612	Principles of Explosives Engineering	3
EXP ENG 5622	Blasting Design And Technology	3
Three other explosives related courses as approved by program coordinator.		

The minor in explosives engineering is not accredited by the Accreditation Board of Engineering and Technology (ABET).

Undergraduate Certificate in Explosives Engineering

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 be exposed to the 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 high school diploma who have a minimum of 12-months of post-high school, professional employment or college experience.

Once admitted to the program, the student must take four designated courses as given below. In order to receive an undergraduate certificate, the student must have an average cumulative grade of 2.0 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 may apply to the B.S. mining engineering program if they so choose. The certificate credits taken by students admitted to the B.S. program may be eligible to count toward their bachelors degrees depending on the degree requirements. Prerequisite courses outside of those in this certificate program may be waived at the discretion of the administrative co-coordinators for persons that are not regular Missouri S&T students.

Once admitted to the program, a student will be given three years to complete the program so long as he/she maintains a 2.0 GPA in the courses taken.

Required courses:

EXP ENG 5612	Principles of Explosives Engineering
EXP ENG 5622	Blasting Design And Technology
Choose any two courses from the list below:	
EXP ENG 5555	Computer Fired Pyrotechnic Show Design and Firing System Operation
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 5713	Demolition of Buildings and Structures
EXP ENG 5922	Tunneling & Underground Construction Techniques
Any 6000 level explosives course or other explosive-related course with approval of the student's advisor and instructor permission.	

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

Students with a GPA of 3.0 in the certificate program may take postgraduate explosives classes as electives.

Explosives Technology Certificate

Once admitted to the program, the student must take four designated 3 credit hour explosives courses for a total of 12 credit hours as given below. In order to receive an undergraduate certificate, the student must have an average cumulative grade of 2.0 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 eligible to apply to the S&T mining engineering B.S. program. The certificate credits taken by students admitted to the B.S. program may be eligible to count toward their bachelor's degrees depending on the degree requirements. Prerequisite courses outside of those in this certificate program may be waived at the discretion of the administrative co-coordinators for persons that are not regular Missouri S&T mining engineering students. Once admitted to the certificate a student will be given three years to complete the certificate so long as he/she maintains a 2.0 GPA in the courses taken.

The following courses constitute the undergraduate 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 and Firing System Operation
EXP ENG 5622	Blasting Design And Technology
EXP ENG 5713	Demolition of Buildings and Structures
EXP ENG 5922	Tunneling & Underground Construction Techniques
EXP ENG 6112	Explosives Regulations

Other courses approved by the explosives engineering faculty may be substituted for any of the above listed courses on a case-by-case basis. Students with a GPA of 3.0 in the certificate program may take graduate level explosives classes as electives.

Matthew Coy, Lecturer
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Catherine Johnson, Robert H. Quenon Associate Professor of Mining Engineering, Associate Professor of Explosives Engineering, Interim Department Chair
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MS Missouri University of Science and Technology

Kelly Williams, Lecturer
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Paul Nicholas Worsey, Professor Emeritus[1]
PHD University of Newcastle-upon-Tyne, United Kingdom

Gillian M Worsey, Assistant Adjunt Professor
PHD University of Missouri-Rolla

EXP ENG 4099 Undergraduate Research (IND 0.0-6.0)
Designed for the undergraduate student who wishes to engage in research. Not for graduate credit. Not more than six credit hours allowed for graduation credit. Subject and credit to be arranged with the instructor.

EXP ENG 5000 Special Problems (IND 1.0-3.0)
Problems or readings on specific subjects or projects in the department. Consent of instructor required.

EXP ENG 5001 Special Topics (LAB 0.0 and LEC 0.0)
This course is designed to give the department an opportunity to test a new course. Variable title.

EXP ENG 5112 Explosives Handling and Safety (LEC 3.0)
Basic handling & safety for explosives, explosive devices and ordnance related to laboratory handling, testing, manufacturing & storage, for both civil and defense applications. Classroom instruction only. Prerequisite: Junior Standing or above.

EXP ENG 5512 Commercial Pyrotechnics Operations (LAB 1.0 and LEC 2.0)
Provide participants with training preparing for Missouri Licensed Display Operator (Outdoor) License and advanced lead pyrotechnic operator training. Class work will be complemented by practical training in laboratory sessions, culminating in a full pyrotechnic show, from start to finish. Prerequisites: Both Chem 1310 and Chem 1319 or their equivalent; US Citizen or permanent resident, Successful background check, resident enrollment at Missouri S&T.

EXP ENG 5513 Stage Pyrotechnics and Special Effects (LAB 2.0 and LEC 1.0)
Use of energetic materials in close proximity to audiences. Provide participants with training preparing for Missouri Pyrotechnics Display Operators License. Covers: close proximity indoor and outdoor pyrotechnics and special effects. Working with stage crews and talent, safety and permitting. Prerequisites: Both Chem 1310 and Chem 1319 or their equivalent; US Citizen or permanent resident, Successful background check, resident enrollment at Missouri S&T.

EXP ENG 5514 Display Fireworks Manufacturing (LAB 2.0 and LEC 1.0)
Theory and practice of manufacturing display fireworks. Focusing on safety, chemical interaction, color development, basic theory, state and federal law. The lab will include hands on building of ball and canister shells and other pyrotechnic effects. Prerequisites: Chem 1310, Chem 1319, Chem 1100; one of Econ 1100, Econ 1200, Eng Mgt 1210; Successful background check.

EXP ENG 5555 Computer Fired Pyrotechnic Show Design and Firing System Operation (LAB 2.0 and LEC 1.0)
Students will learn to use music editing, electronic firing system operation and Fire One pyrotechnic choreography and simulation software to design their own pyromusical show programs. Creation of a musical sound track, selecting the fireworks and choreographing to the musical score. Create, setup, diagnose and fire a pyrotechnic show. Prerequisites: Exp Eng 5512 or Exp Eng 5513 and successful background check.

EXP ENG 5612 Principles of Explosives Engineering (LAB 1.0 and LEC 2.0)
Theory and application of explosives in the mining industry; explosives, initiating systems, characteristics of explosive reactions and rock breakage, fundamentals of blast design, drilling and blasting, regulatory and safety considerations. Prerequisites: Min Eng 1912; successful background check. (Co-listed with Min Eng 5612).

EXP ENG 5622 Blasting Design And Technology (LAB 1.0 and LEC 2.0)
Advanced theory and application of explosives in excavation; detailed underground blast design; specialized blasting including blast casting, construction and pre-splitting. Introduction to blasting research. Examination of field applications. Prerequisites: Exp Eng 5612 or Min Eng 5612. Student must be at least 21 years of age. Successful background check. Consent of instructor.

EXP ENG 5711 Explosives in Industry (LEC 3.0)
Overview of how explosives are applied in various industrial settings. Focus is placed on the general application, identification, and necessity of explosives in industry. Topics include explosive use in surface and underground mining, road development, construction, utility placement, demolition, oil, gas, and underwater.

EXP ENG 5713 Demolition of Buildings and Structures (LAB 1.0 and LEC 2.0)
Provide participants with basics and solid grounding in the equipment, techniques and processes required for the demolition and remediation of mine plant and processing equipment sites and non-mining structures such as buildings, factories, bridges, etc. Field trip required. Prerequisites: Preceded or accompanied by Civ Eng 2200 or Mech Eng 2340; US citizen or permanent resident; Successful background check.

EXP ENG 5721 Specialty Uses of Energetic Materials (LEC 3.0)
Overview of special, less common uses of energetic materials and how they can be applied as a functional tool. Topics include the use of energetics in aerospace, explosive ordnance, oil field development, welding, pyrotechnics, theatrics, and cinematic special effects.

EXP ENG 5914 Explosives Manufacturing (LEC 3.0)
History of industrial explosives from discovery to what is used today. Manufacturing processes for packaged and bulk explosives are explored along with specialty explosives such as detonating cord, cast boosters, detonators, shaped charges, and commercial fireworks. Field manufacturing of explosives by mixing or gassing is also covered. Prerequisites: Successful background check, consent of instructor.

EXP ENG 5922 Tunneling & Underground Construction Techniques (LAB 1.0 and LEC 2.0)
Mechanical and conventional excavation techniques in underground tunneling and construction. Topics include tunneling layouts design, equipment and performance modeling, ground control systems including support, drainage, and structural integrity. Construction specifications, advance rate and contractual and cost estimation. Prerequisite: Successful background check. Consent of instructor.