

University of Tripoli
Faculty of Engineering

MINING ENGINEERING DEPARTMENT
Graduate programs

General Information

The Mining Engineering Department offers work in a wide range of general areas to Master of Science. The graduate program is design to educate mining engineers for higher level and challenging efforts in research, development, design, industry, university teaching. Each student works with a faculty advisor in selecting the courses which he/she wishes to take from the many subjects offered within the department. The various areas offered are flexible to provide specialization in particular phases of the mining operation. Graduate candidate may be pursued in the field of geo-mechanics, mineral dressing and mineral exploration.

The facilities of the department include laboratories for rock mechanics survey, mineral beneficiation (crushing and grinding, jaw crushing, magnetic separation, flotation and others.

Vision

To be leader in the field of Mining Engineering, applied research and community services. Endorsing a high quality learning experience and advancing the knowledge of graduate students to gain the skills and insights to undertake their careers with confidence

Mission

To prepare motivated and qualified mining engineers and promote research applied to the exploitation of the indigenous resources as a contribution to national wealth, by providing a high quality education and academic training

Programs

The department awards M.Sc. degree in 3 discipline programs:

- 1- *Mineral Exploration*
- 2- *Geomechanical and Tunneling Engineering*
- 3- *Ore Dressing*

Every program is comprised of minimum 24 credits of courses, 1 credit for graduate seminar, and 6 credits for the thesis with a total of 31 credits.

Students after completion of the required courses are encouraged to select a thesis topic in their area of specialization within the field of Mining Engineering. It is the policy of the department that the selection of a thesis topic and thesis advisor is a voluntary process which is initiated by the student.

Program I

PROGRAM	Mineral Exploration
DEGREE	M. Sc.
OBJECTIVES	1. Expose students to the latest developments in the field of mineral exploration Engineering. 2. Provide students with the appropriate skills and tools to understand their profession. 3. Prepare specialized mineral exploration engineers capable of understanding and facing the challenges. 4. Enable students to have a background and the required skills to conduct high-quality scientific research.

Code	Title	Credits	Hours	ECTS
Faculty Requirements (3 credits)				
GE604	Advanced Engineering Mathematics	3	4	8
GE609	Numerical Methods in Engineering **	3	4	8
GE606	Applied Statistics and Computer Application	3	4	8
Department Requirement (9 credits)				
MinE611	Mineral Evaluation	3	4	8
MinE612	Advanced Rock Mechanics	3	4	8
MinE613	Environmental Engineering	3	4	8
MinE614	Advanced GIS	3	4	8
Elective courses (13 credits)				
MinE620	Engineering Site Investigation	3	4	8
MinE621	Mineral Exploration	3	4	8
MinE622	Rock Slope Stability	3	4	8
MinE623	X ray analysis	3	4	8
MinE624	Advanced Topic in Rock Engineering.	3	4	8
MinE626	Advanced soil mechanics	3	4	8
MinE627	Advanced computer application	3	4	8
MinE697	Special Topics	3	4	8
MinE698	Graduate Seminar **	1	2	10
Thesis (6 Credits)				
MinE699	Thesis	6	-	50
TOTAL		31	-	124

** Mandatory Courses

ECTS: European Credit Transfer and Accumulation System

Program II

PROGRAM	Geomechanical and Tunneling Engineering
DEGREE	M. Sc.
OBJECTIVES	1- Expose students to the latest developments in the field of Geomechanical and Tunneling Engineering. 2- Provide students with the appropriate skills and tools to understand their profession. 3- Prepare specialized geomechanical engineers capable of understanding and facing the challenges. 4- Enable students to have a background and the required skills to conduct high-quality scientific research.

Code	Title	Credits	Hours	ECTS
Faculty Requirements (3 credits)				
GE604	Advanced Engineering Mathematics	3	4	8
GE609	Numerical Methods in Engineering **	3	4	8
GE606	Applied Statistics and Computer Application	3	4	8
Department Requirements (9 credits)				
MinE611	Mineral Evaluation	3	4	8
MinE612	Advanced Rock Mechanics	3	4	8
MinE613	Environmental Engineering	3	4	8
MinE614	Advanced GIS	3	4	8
Elective courses (13 credits)				
MinE630	Design and support of Underground opening	3	4	8
MinE631	Rock modeling	3	4	8
MinE632	Rock Fracture Mechanics	3	4	8
MinE633	(Experimental) Stress-Strain analysis	3	4	8
MinE634	Instrumentation field measurement	3	4	8
MinE636	Reservoir engineering	3	4	8
MinE624	Advanced Topic in Rock Engineering.	3	4	8
MinE697	Special Topics	3	4	8
MinE698	Graduate Seminar **	1	2	10
Thesis (6 Credits)				
MinE699	Thesis	6	-	50
TOTAL		31	-	124

** Mandatory Courses

ECTS: European Credit Transfer and Accumulation System

Programe III

PROGRAM	Ore Dressing
DEGREE	M. Sc.
OBJECTIVES	1- Expose students to the latest developments in the field of ore dressing Engineering. 2- Provide students with the appropriate skills and tools to understand their profession. 3- Prepare specialized ore dressing engineers capable of understanding and facing the challenges. 4- Enable students to have a background and the required skills to conduct high-quality scientific research.

Code	Title	Credits	Hours	ECTS
Faculty Requirements (3 credits)				
GE604	Advanced Engineering Mathematics	3	4	8
GE609	Numerical Methods in Engineering **	3	4	8
GE606	Applied Statistics and Computer Application	3	4	8
Department Requirements (9credits)				
MinE611	Mineral Evaluation	3	4	8
MinE612	Advanced Rock Mechanics	3	4	8
MinE613	Environmental Engineering	3	4	8
MinE614	Advanced GIS	3	4	8
Elective courses (13credits)				
MinE640	Minerals Separation	3	4	8
MinE641	Minerals Processing modeling	3	4	8
MinE642	Analytical Chemistry	3	4	8
MinE643	Industrial mineral production	3	4	8
MinE644	Analysis Methods of minerals	3	4	8
MinE646	Powder technology	3	4	8
MinE647	Surface chemistry of flotation	3	4	8
MinE648	Advanced coal preparation	3	4	8
MinE649	Corrosion engineering	3	4	8
MinE697	Special Topics	3	4	8
MinE698	Graduate Seminar **	1	2	10
Thesis (6 Credits)				
MinE699	Thesis	6	-	50
TOTAL		31	-	124

** Mandatory Courses

ECTS: European Credit Transfer and Accumulation System

Description of the Graduate Courses

GE604 Advanced Engineering Mathematics (3 Credits – 4 Hours)

Review of ordinary differential equations; linear differential equation of the first order; linear differential equations with constant coefficients; particular solutions by variations of parameters. Power series solutions; method of Frobenius; Legendre's equation; Fourier-Legendre Series; Bessel's equation; modified Bessel equation. Fourier methods; Fourier series; Sturm-Liouville theory; Fourier integral; Fourier transformation. Partial differential equations; heat conduction equation; separation of variables; waves and vibrations in strings; wave equation; D'Alembert's solution; longitudinal vibrations in an elastic rod; two dimensional stress systems; solution of Navier's equations by the application of Fourier transforms; Laplace equation.

GE606 Applied Statistics and Computer Application (3 Credits – 4 Hours)

Random variables; common discrete, continuous expectations and their applications; Sampling of the mean, hypothesis testing of the mean and variance, confidence intervals and Chi-Square procedures; Simple linear regression and correlation; precision and straight line fits; Matrix approach; multiple; Linear regression; polynomial and extra sum of squares in linear regression analysis; Transformation, weighted dummy variables and special topics in multiple regression analysis; Selecting the best regression model; Design of experiments; Single-factor and Multi-factor analysis of variance. Application of Statistical software packages such as: MINITAB, SPSS, etc....

GE609 Numerical Methods in Engineering (3 Credits – 4 Hours)

Interpolation; Linear interpolation, Lagrange and Aitkin's interpolating polynomials, Difference calculus, Newton forward and backward difference formula, curve fittings, least square approximations, Fitting nonlinear curves, Cubic spline, Chebyshev polynomials, Approximation with rational function ordinary differential equations, Analytical and computer-aided solutions, Boundary conditions, Taylor series method.

MinE611 Mineral Evaluation (3 Credits – 4 Hours)

Fundamental factors critical to: the evaluation of mineral deposit, and evaluation of objectives selection of capacity and cutoff grade, method of ore reserve calculations, feasibility study (production and costs), Kirging, relationship between grade and density. Drilling for geological information.

MinE612 Advanced Rock Mechanics (3 Credits – 4 Hours)

Advance treatment of theoretical and experimental aspects of rock mechanics, mechanics of discontinuities, rock dynamics, Rock engineering involving advance analytical and design aspects of rock slope, underground openings and blasting of rock, foundations on rock.

MinE613 Advanced GIS (3 Credits – 4 Hours)

GIS functions, capturing data, storing data, Analysis, organizing spatial, representing feature in vector data, map scale, components of geographic data, query data, display, and output.

MinE614 Environmental Engineering (3 Credits – 4 Hours)

Application of basic courses in environmental Engineering and Hydraulics to water and wastewater treatment solid waste disposal. The principles of biological, chemical, and physical processes are stresses as they relate to water, wastewater treatment and pollution control. Natural and manmade characteristics of water quality and practical aspects of solid waste management.

MinE620 Engineering Site Investigation (3 Credits – 4 Hours)

Students learn drilling, sampling, logging, and testing methods, and they practice using geological knowledge to optimize site investigations.

MinE621 Mineral Exploration (3 Credits – 4 Hours)

This course uses the concept and practice of applied geology as its control them, which include comprehensive treatment of geological, geochemical, geophysical, and economic element of exploration and mining.

MinE622 Rock slope stability (3 Credits – 4 Hours)

Structure geology and data interpretation, Site investigation and geological data collection, rock strength properties and their measurement, failure types movement monitoring and stabilization of rock slopes and numerical analysis for mining applications

MinE623 X-ray Analysis (3 Credits – 4 Hours)

Theory of x-ray , XRD , XRF application and examples.

MinE624 Advanced Topics Rock Engineering (3 Credits – 4 Hours)

Rock mass properties and numerical modeling applied to rock engineering design with particular emphasis on application in rock slope and tunneling

MinE626 Advanced soil mechanics (3 Credits – 4 Hours)

Clays mineral (Composition of clay minerals, specifics surface of clay minerals and others), flocculation and dispersion of clay partial, Hydraulic uplift force under structure and consistency of cohesive soil (Atterberg Limits , liquidity index, activity).

MinE627 Advanced computer application (3 Credits – 4 Hours)

The use of computer techniques to aid in solving such mineral problems as ore reserve calculation, financial evaluation, optimum pit design, and optimum haulage system. Digital simulation methods are used extensively.

MinE630 Design and support of Underground opening (3 Credits – 4 Hours)

Rock mass classifications (RQD, Q-system, RMR), rock behavior: isotropic and anisotropic , limit of plastic / elastic zone of rock mass, boundary conditions for elastic and plastic zone, method of tunnel support (shotcrete, rock bolts), drilling and blasting techniques. Stress determination around the opening, selection of opening method, TBM, R.H, NATM and drilling program, advance mathematical method for opening design, finite element application for different shapes.

MinE631 Rock modeling (3 Credits – 4 Hours)

Theory of failure, Finite elements, Finite difference, Rock behavior, Plastic elastic

MinE632 Rock Fracture Mechanics (3 Credits – 4 Hours)

Introduction, some fundamental aspects of mechanics, the Griffith theory, linear elastic fracture mechanics and fracture initiation theories, aspects on non-linear fracture mechanics, determination of stress intensity factor, application.

MinE633 Experimental of Stress-Strain Analysis (3 Credits – 4 Hours)**MinE624 Advanced Topic s Rock Engineering** (3 Credits – 4 Hours)

Rock mass properties and numerical modeling applied to rock engineering design with particular emphasis on application in rock slope and tunneling

MinE636 Reservoir Engineering (3 Credits – 4 Hours)

Introduction, reservoir perforation, fundament properties of fluid permeated rock, porosity, permeability, properties of rock media, data evaluation for reservoir calculation, Geomechanical evaluation field evaluation of borehole collapse, gas reservoir engineering, computer modeling

MinE634 Instrumentation field measurement (3 Credits – 4 Hours)

This course comprises a comprehensive of complete presses involved in instrumentation and monitoring in geotechnical environment. THIS COURSE WII CONSIDER THE TYPE AND Installation of field instruments and interpretation of instrument results.

MinE640 Minerals Separation (3 Credits – 4 Hours)

A pronounced trend toward coarser grinding for flotation, partly as result of milling lower grade ores. Automatic process control (emphasizing the needs for eliminating errors future plant.

MinE641 Minerals Processing Modeling (3 Credits – 4 Hours)

Definition of the problem, construction of the model of system, testing of the model, Solution of the problem using the model, implementing the solution. In the design stage, plant operating manual (execution start-up). Design criteria (i.e. guide in detailed designer and set out such items are climatologically data relating to structural, heating, etc.

MinE642 Analytical Chemistry (3 Credits – 4 Hours)

The goal is to provide a background in surface and colloidal science and give the student a solid framework for applying knowledge in colloid and surface science to the solution of practical problems and the development of new technologies

MinE643 Industrial Minerals production (3 Credits – 4 Hours)

Usual states in deposit, usual forms for end users, general steps in processing. Reduction to individual mineral particle forms without break down of unique structure practice in recent years. I.C.P, Gravimetric analysis for mineral composition

MinE644 Analysis Methods of Mineral (3 Credits – 4 Hours)

X-RD, X-RF, S.E.M, The support material for the course are copies of the slides used to present the course along with a few key text books and review articles - which the students are encouraged to use to supplement the documents provided

MinE646 Powder technology (3 Credits – 4 Hours)

This course discusses and presents the science & technology of important powder processing steps like compaction, dispersion, sintering and novel densification technologies. Laser grain size analysis, prevision of complex material, Method of production powder, mechanical preparation, principle unit, and design for powder, application technology for powder usage complex mechanical properties

MinE647 Surface Chemistry of Flotation (3 Credits – 4 Hours)

Surface area, surface tension (adsorption, absorption) Anionic and cationic collectors, Laboratory testing, Rougher-scavenger cleaner system etc.

MinE648 Advanced coal preparation (3 Credits – 4 Hours)

Properties of Coal and Coal impurities, wash ability characteristics, coarse coal washing-jig, H.M etc. Fine Coal washing – Hydraulic concentration, Liquid –Solid Separation, Designing plant circuit and Economics of coal preparation.

MinE649 Corrosion engineering (3 Credits – 4 Hours)

Introduction corrosion problems, corrosion theory, superficial surface layers, elector mechanical perception, effective mechanical stress, metallic protect to plant layer (organic / inorganic), protective additive from corrosion, cathode protection.

MinE697 Special Topics (3 Credits – 4 Hours)

The topics are not listed in department programs and may vary from year to year according to interests of students and instructors.

M.S. students choose and study a topic under the guidance of the department coordinator. Typical contents include advanced fields of study according to recent scientific and technological developments in the related areas. Also, it could be studied from other related departments after getting the permission.

MinE698 Graduate Seminar (1 Credits - 2 Hours)

This course help students to develop their research proposals, establishing and expanding their research skills and implementing their work through scholarly writing, which can be achieved through the seminar.

The seminar course must to be taken in the second semester of the registration and managed by an instructor who is responsible to prepare the final grade list of all the registered students.

Students must prepare and present their chosen topics through a scientific term paper, which can be shared and discussed with other students and department staff to gain their feedback.

MinE699 Thesis (6 Credits)

The candidate will present the results and finding illustrated the application of his / her results.

- *Learning Objectives (outcomes)*

Program I: Mineral Exploration This program will prompt and prepare high superiority graduate student as professional engineer in field of minerals Exploration including ore reserve estimation, design open mine using up data technology.

Program **II**: Geomechanical and Tunneling Engineering This program will prompt and prepare high superiority graduate student as professional engineer in field of Geomechanical such as rock slopes and tunnel deign and support systems.

Program **III**: Ore Dressing: This program will prompt and prepare high superiority graduate student as professional engineer in field of minerals treatment products and plants design for industries.

الإعتماد			
البيان	منسق الدراسات العليا بالقسم	رئيس القسم	مدير مكتب الدراسات العليا بالكلية
الاسم			
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التوقيع			
الختم			

اعداد / لجنة دليل الدراسات العليا 2022