NCEES
advancing licensure for engineers and surveyors

NCEES Principles and Practice of Engineering Examination
MINING AND MINERAL PROCESSING Exam Specifications

Effective Beginning October 1, 2021

- The exam topics have not changed since October 2016 when they were originally published.
- The PE Mining and Mineral Processing exam is computer-based. It is closed book with an electronic reference.
- Examinees have 9.5 hours to complete the exam, which contains 85 multiple-choice questions. The 9.5-hour time includes a tutorial and an optional scheduled break. Examinee works all questions.
- The exam uses both the International System of units (SI) and the US Customary System (USCS).
- The exam is developed with questions that will require a variety of approaches and methodologies, including design, analysis, and application.
- The knowledge areas specified as examples of kinds of knowledge are not exclusive or exhaustive categories.
- The exam includes universal considerations common to each of the knowledge and skill groups. The universal considerations topics include general engineering skills, engineering economics and cost management, observance of laws and regulations, and facility construction. These universal considerations may be incorporated into any of the questions on the exam.

	Number of Questions
1. Exploration	**9–15**
A. Exploration Methods and Techniques	3–5
1. Fundamental physical and structural geology, stratigraphy, mineralogy, and geochemistry	
2. Geological surveying, mapping, and geophysics (e.g., aerial photography, strike and dip, three-point problems)	
3. Laws and regulations governing hard-rock minerals, leasable minerals, and common-variety minerals (e.g., 1872 Mining Law, Titles 30 and 43 CFR)	
B. Site Geologic and Geotechnical Conditions	3–5
1. Hydrology/hydrogeology	
2. Sampling techniques (e.g., exploratory drilling, trenching, field samples)	
3. Analysis and interpretation (e.g., chemical and physical properties of the samples, rock mass classifications, ground stress)	
4. Modeling (e.g., geologic, digital terrain model [DTM])	
5. Geology and genesis of mineral deposits (e.g., mineralogy, petrology, classification of ore deposits)	
C. Resources/Reserves	3–5
1. Resource/reserve classification systems	
2. Economic geology (e.g., grade distribution, cutoff grade, stripping ratios)	
3. Resource estimation techniques and interpretation (e.g., quality and quantity methodologies)	

2. Mine Planning/Operations **27–41**

A. Mining Methods and Layouts 7–11
   1. Surface mining methods and planning (e.g., contour strip, open pit/area, quarries, dredging)
   2. Underground mining methods and planning (e.g., block caving, cut and fill, room and pillar, shrinkage stopping, underhand and overhand stopping, longwall)
   3. In situ mining methods and planning
   4. Deposit access (e.g., adits, slopes, shafts, haul roads)

B. Mine Equipment, Facilities, and Systems 12–16
   1. Production
   2. Material handling and transportation
   3. Ventilation
   4. Power distribution (e.g., electrical, compressed air, hydraulic)
   5. Rock fragmentation (e.g., cutting/boring machines, drilling, blasting and explosives)
   6. Pumping, dewatering, and drainage
   7. Communication, monitoring, and control

C. Ground Control 4–7
   1. Surface and underground ground control analysis and methods for coal, hard rock, and industrial minerals (e.g., slope stability, strata control, pillar design, shaft stability, geomechanics)
   2. Rock mass classification systems (e.g., RQD)
   3. Physical properties and strength-testing techniques, results, and application

D. Mine Planning and Systems 4–7
   1. Mine surveying and mapping
   2. Resource requirements evaluation (e.g., equipment, materials, personnel, logistical support)
   3. Mine maintenance systems

3. Mineral Processing **21–32**

A. Laboratory/Pilot Testing and Results 4–6
   1. Lab-scale metallurgical, mineral processing, and analytical test procedures (e.g., atomic absorption, diagnostic leaching, solvent extraction, Bond work index, coal washability, physical separations)
   2. Integration of mineralogical and chemical characteristics for selection of appropriate processing techniques

B. Process Flow Sheets 7–11
   1. Laboratory and pilot results interpretation, process flow sheet determination, and production level scale-up
   2. Extractive metallurgical principles (e.g., hydrometallurgy and pyrometallurgy)
   3. Comminution, classification, and beneficiation principles (e.g., crushing, grinding, flotation, gravity separation)
   4. Solid/liquid separation principles (e.g., thickening, filtration, countercurrent decantation [CCD])
   5. Material, water, heat, and energy balances

C. Plant Equipment, Facilities, and Systems 6–9
   1. Site considerations and plant layout
   2. Piping and instrumentation diagrams (P&ID)
   3. Unit operations and equipment selection and sizing (e.g., tank sizing, pumping, piping, conveying)

D. Plants and Facilities 4–6
   1. Control of plant performance (e.g., operation and maintenance of mill or mineral processing equipment, process control systems)
   2. Resource requirements evaluation (e.g., reagents, materials, personnel, mill feed, logistical support)

4. Environment and Reclamation 13–22

A. Site, Mining, and Process Environment 3–5
   1. Contaminant characterization and transport (i.e., air, ground/surface water, solids)
   2. Environmental chemistry, geochemistry, geology, ecology, and biology
   3. Waste characterization
   4. Characterization of site conditions through interpretations of field and laboratory data

B. Exploration, Mining, and Processing Impacts 4–7
   1. Waste disposal and containment systems (e.g., backfill, tailings and slurry impoundments, caps, liners, leakage recovery and detection systems)
   2. Water treatment systems (e.g., potable, process, mine, wetlands)
   3. Mining and processing solid waste disposal and treatment systems
   4. Pollution monitoring and prevention measures (e.g., sediment control, surface water discharge, dust, air filtration systems)
   5. Site water balance

C. Environmental and Reclamation Plan 3–5
   1. Site monitoring and analysis (e.g., subsidence, ground and surface water, vibration, noise, air)
   2. Environmental planning and cost estimation through postclosure
   3. Reclamation planning and cost estimation through postclosure

D. Reclamation and Postclosure 3–5
   1. Earthwork techniques and equipment (e.g., grading, cutting, filling, ripping)
   2. Postmining land configuration and erosion control system design (e.g., riprap, ditches, silt fences, matting, sedimentation ponds)
   3. Site monitoring and bond release (e.g., groundwater, vegetation)