



# CAREERS

IN THE MINING  
AND MINERALS  
SECTOR



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## How to Make a Career Choice in the Mining and Minerals Sector

In choosing a career, several steps should be followed:

### Step 1: Know yourself

Do not expect to know what you want to do until you know yourself. The first step in realising your career dreams and achieving job satisfaction is to have a detailed picture of your desires, goals, strengths and weaknesses. This should provide clear guidance as to what you could pursue as a possible career.

Self-knowledge is developed through:

- Intensively thinking about yourself.
- Conversations with relatives, friends, and contacts.
- Psychometric tests conducted by a psychologist.

To develop a better understanding of yourself, simply ask yourself the following questions:

- What are my skills and abilities?
- Which of these skills and abilities are most prominent?
- What are my strengths and weaknesses?
- Which subjects am I taking at school?
- How am I doing in my subjects?
- What activities do I enjoy most?
- Would I prefer working on my own or as a member of a team?
- How will I get along with my supervisor and my co-workers?
- What kind of people would I like to work with?
- Do I prefer to work indoors or outdoors?
- What would give me career satisfaction?
- In what type of work environment would I be happy?
- What personal qualities do I possess that will help me in the career I choose?
- How do I deal with high-pressure situations?
- How will my personality influence my career choice?

### Step 2: Identify career options

While gathering information and researching careers, you will need to start identifying your options. Career options entail obtaining knowledge about different types of careers:

- The type of work in different careers.
- The salary and benefits of different careers.
- The type of person who will fit the specific occupation.

- Subjects required.
- Personal characteristics required.

Some information sources that you can use to obtain career information include:

- Reading career magazines/books/career supplements in newspapers.
- Attending career exhibitions.
- Consulting a career guidance counsellor.
- Visiting workplaces.
- Talking to employees.
- Talking to employers.
- Visiting your nearest career information centre (universities, universities of technology and FET colleges)
- Contacting professional societies.
- Contacting the Department of Labour.
- Browsing the internet.
- Browsing the Mining Qualifications Authority (MQA) website.
- Reading advertisements.

### **Step 3: Evaluate career options**

Once you have completed your research, evaluate the career options you have identified:

- Identify what additional resources and information you will need.

Questions you should ask yourself at this point are:

- What are my options as far as my career is concerned?
- Are there any areas of work or careers I have a specific interest in?
- What other types of jobs or careers should I be considering?

### **Step 4: Select one of the career options**

Based on the information you have gathered and analysed, you should now be able to select one of the career options. Career choice is a process. It starts when you are very young and continues your entire working life. It is an ongoing investment in who you are and how you fit into the world of work.

How to make the right choice:

- Match your specific characteristics with a specific career.
- Choose a career path that has different options and opportunities.
- Ask yourself why you have chosen the particular career.
- Try to obtain exposure to the career, for example vacation work, voluntary work or an internship.
- Is there an economic demand for your chosen career?

Talk to a career guidance counsellor about the following points:

- Self-knowledge.
- Planning a career.
- Subject choice.
- Academic planning skills.
- CV writing.

### **Step 5: Design an action plan**

You can now begin to develop and implement a plan of action. Ask yourself:

- What information or resources do I need to execute my plan of action?
- Are there any obstacles in pursuing my career decision and how can I overcome them?
- What steps should be taken to implement my career decision?



## Mainstream Career Paths in the Mining and Minerals Sector

Figures 2.1 and 2.2 show some of the typical mainstream career paths that can be followed within a company in the Mining and Minerals Sector, highlighting the educational and experiential requirements for the particular position, as well as the approximate time frames to progress to the next position. These estimated time frames must be used as a guideline only. Individual progression can vary from those reflected in the figures below, depending on the individual's performance as well as the company's organisational requirements.

**Figure 2.1 – Typical Mining Engineering Career Progression**

Position	Position Requirements	Estimated Time Frames
Miner	Grade 12; Best Management Practices; Supervisory Effectiveness; Blasting Certificate	± 3 Years
Shift Boss	Shift Boss Certificate of Competency	± 3 Years
Mine Overseer	Mine Overseers Certificate of Competency	± 5 – 6 Years
Mine Manager	Mine Manager's Certificate of Competency	± 6 – 8 Years

**Figure 2.2 – Mechanical or Electrical Engineering Career Progression**

Position	Position Requirements	Estimated Time Frames
Artisan	Grade 12; Trade Test	± 4 Years
Engineering Foreman	Grade 12; National Diploma in Engineering	± 5 Years
Section Engineer	GCC Plus National Diploma or B. Eng. or B. Tech. in Mechanical or Electrical	± 6 – 8 Years



## Technical and Artisan Career Options

There is currently a shortage of qualified and experienced artisans across several disciplines within the mining sector.

### Artisans

An artisan is a skilled, usually trained and tested individual who works with his/her hands. These are skilled, formally trained technical workers that specialise across a variety of fields and drive the industry in terms of engineering.

With the current and projected shortage of qualified artisans, new artisans are almost guaranteed to find employment. With the successful completion of their trade test, they will earn a good salary. The mining sector is therefore on a major drive to increase the number of learners registered in engineering learning programmes such as Fitting and Turning, Diesel Mechanic and Boilermaker, to name a few.

### Career Path Options

Artisans are trained through a four-year apprenticeship programme offered by companies which are accredited as a Skill Development Provider. The apprentice learnership programme itself, is formally registered with a SETA such as the Mining Qualification Authority (MQA).

Apprenticeships combine theory, practical work and workplace practice in a chosen trade field and in the case of a listed trade ends in a trade test and an artisan certificate of competence. In South Africa, apprenticeships are monitored by the Quality Council for Trades and Occupation (QCTO). The National Artisan Moderation Body (NAMB) oversees the quality assurance of apprenticeships on behalf of the QCTO.

NAMB is responsible for moderating trade tests, developing and managing a national database of registered artisan trade assessors and moderators, recording artisan achievements and recommending the certification of artisans to the QCTO.

The apprentice/learner must successfully complete:

- 32 weeks of formal, theoretical training.
- 80 weeks of practice training in the workplace under the guidance of a mentor.
- Pass four phase tests.

After successfully completing the above, the apprenticeship/learner will sit for their final trade test and qualify as an artisan.

## Why choose a career as an artisan

There are a great number of career opportunities for any learner who decides to pursue a trade qualification. Learners who are suited to become artisans would enjoy applying their knowledge to solve problems and achieve goals in a practical manner. Artisans enjoy working and making things with their hands.

What are some of the benefits of following the artisan career path? Learners who meet the criteria to become artisans can gain valuable practical and theoretical experience. They may also enjoy a high likelihood of employment by registering in a learnership programme. Becoming an artisan does not limit the learner to always work within their specific trade. It is completely possible that an experienced artisan could move into a supervisory role, and from there into various levels of management.

## Artisan Trades Employed in the Mining and Minerals Sector

### Fitter and Turner (Fitter)

Fitters are highly skilled craftspeople who manufacture, construct, assemble and fit components for machinery, vehicles, installations and other apparatus or articles. Fitter and turners are also responsible for the maintenance and repair of such equipment.

#### Satisfying aspects:

- Working with your hands.
- The opportunity to specialise.
- Good employment opportunities and earning potential.
- The challenge of constructing and maintaining equipment.
- Seeing the results of your work.

#### Demanding aspects:

- Physical demands such as standing, bending and crouching can be tiring.
- Working overtime on public holidays as well as weekends and nightshift work.
- Working in noisy, dirty and sometimes crowded conditions.

#### Requirements:

A Fitter and Turner should:

- Be at least 18 years old.
- Physical fit
- Undergo aptitude test
- Meet all vetting requirements as set by the Company (no criminal record)
- Be meticulously accurate.
- Enjoy working with their hands.
- Be practical.
- Have mathematical aptitude.
- Be patient and even-tempered when setting up a machine and watching the machine while turning is in progress.
- Able to concentrate under noisy working conditions.
- Be responsible.
- Be able to read 3-dimensional drawings.
- Understand mechanical components.

#### Entry requirements:

You will need to obtain an N2 qualification. If you have passed grade 12 with a science and maths pass rate of more than 40%, you will only need to write and pass 2 of the 4 subjects (Engineering Drawing and Trade Theory) to obtain your N2 qualification. If you have not passed the grade 12 science and maths exam, then you would need to enrol for all 4 subjects (Maths, Engineering Science, Engineering Drawing and Trade Theory) to obtain your N2 qualification.

### Possible career advancement opportunities:

- Technician.
- Maintenance supervisor.
- Mechanical foreman.
- Maintenance overseer.
- Engineer (must complete relevant N6 subjects and GCC).

### **Electrician**

Electricians provide specialised skill to support operations and maintenance. They are involved in the generation, transmission, distribution and usage of electricity. They install, repair and maintain and repair electrical wiring, equipment, fixtures and electrical systems. They detect electrical faults and repair them. Repairs may involve replacing fuses, switches or wires. Once the repair is complete the electrician tests the equipment to ensure that it is working properly.

By law, only qualified electricians are allowed to connect cables to electric motors and switchgear, and to handle the electrical wiring of all electrically equipped buildings. During the building of, for example, a new factory, an electrician must ensure that the electrical cables are installed.

### A construction electrician is involved in:

- Pre-planning of installations in domestic, industrial, and commercial premises.
- Installation of wireways and switchboards according to specifications and regulations.
- Installation of wiring and metering equipment without clashing with other services.
- Calculation of electrical load requirements.
- Selection of cables and conductors.
- Determination of protective devices.

In the distribution of electricity, electricians supervise the erection of pylons, the connection of high-tension cabling on pylons, and ensure the thorough insulation of the pylons. Suitable transformers and switchboards, which reduce the current, must be installed at substations.

Electricians working at power stations install and maintain power generators, including the servicing of electrical meters and transformers. Some perform regular inspections on motors, switchgear and transformers to ensure safe functioning.

### Satisfying aspects:

- Variety of work tasks and locations.
- Solving problems.
- Working with your hands.

### Demanding aspects:

- Working in awkward or cramped positions.
- Working in noisy and dirty environments.
- Working overtime or at night.

### Requirements:

Electricians should:

- Be at least 18 years old.
- Physical fit
- Undergo aptitude test
- Meet all vetting requirements as set by the Company (no criminal record)
- Be responsible, alert and cautious.
- Enjoy working with their hands.
- Be inventive, self-reliant and accurate.
- Be able to work under pressure.
- Communicate effectively with fellow workers.

- Have good health and stamina.
- Have good eyesight and colour vision.
- Have manual dexterity and mechanical aptitude.

#### Entry requirements:

You will need to obtain an N2 qualification. If you have passed grade 12 with a science and maths pass rate of more than 40%, you will only need to write and pass 2 of the 4 subjects (Engineering Drawing and Trade Theory) to obtain your N2 qualification. If you have not passed the grade 12 science and maths exam, then you would need to enrol for all 4 subjects (Maths, Engineering Science, Engineering Drawing and Trade Theory) to obtain your N2 qualification.

#### Possible career advancement opportunities:

- Technician.
- Electrical foreman.
- Maintenance overseer.
- General engineering (must complete relevant N6 subjects and GCC).

### **Diesel Mechanic**

Diesel mechanics diagnose and repair the mechanical and electrical faults of diesel-powered vehicles and machinery. Diesel mechanics diagnose engine trouble, dismantle the engine when necessary, and replace or repair defective parts. They reassemble the engine, and repair mechanical and electrical faults in construction machinery.

In most cases electrical diagnostic equipment is used to locate problems. Experienced diesel mechanics can locate a problem by listening to the noise in the engine. Mechanical parts are replaced, or minor adjustments made. Diesel mechanics also complete job cards, furnish information on the parts that should be ordered and assist in training learners. They often perform administrative and managerial tasks. Working conditions of the diesel mechanic vary according to the place of employment, for instance, a well-equipped workshop or farm, ship or construction site.

#### Satisfying aspects:

- Variety of work tasks.
- Working with your hands.
- The challenge of diagnosing and solving problems.
- The opportunity to specialise.

#### Demanding aspects:

- Working in awkward or cramped positions.
- Having to work in dirty, noisy workshops.
- Dealing with impatient, critical or rude customers.

#### Requirements:

Diesel Mechanics should:

- Be at least 18 years old.
- Physical fit
- Undergo aptitude test
- Meet all vetting requirements as set by the Company (no criminal record)
- Enjoy working with their hands.
- Have mechanical aptitude and ability.
- Be able to communicate with people.
- Be practical and responsible.
- Have good eyesight and hearing.
- Have good hand-eye coordination.
- Possess physical strength, good health and stamina.

### Entry requirements:

You will need to obtain an N2 qualification. If you have passed grade 12 with a science and maths pass rate of more than 40%, you will only need to write and pass 2 of the 4 subjects (Engineering Drawing and Trade Theory) to obtain your N2 qualification. If you have not passed the grade 12 science and maths exam, then you would need to enrol for all 4 subjects (Maths, Engineering Science, Engineering Drawing and Trade Theory) to obtain your N2 qualification.

### Possible career advancement opportunities:

- Technician.
- Maintenance overseer.
- Workshop foreman.
- Maintenance manager.

## **Boilermaker**

Boilermakers manufacture and build structures of steel, plate and piping ranging from boilers for steam engines and pressure vessels for power stations and petrochemical plants, to mine headgear, bridges and oil-drilling platforms.

Prior to the construction of a new boiler, all the material must first be prepared before the actual assembly and construction can begin. Drawings are made in separate sections and many calculations are made in the process.

Plates are marked and cut to the correct dimensions, using cutting torches or guillotines. They are then bent into the required shape. This is done manually using hand tools or mechanically by using bending brakes, rolling machines and heating procedures. The various parts are then assembled and prepared for welding.

Boilermakers are also responsible for cleaning and inspecting boilers to ensure that they work effectively. Because boilers must last a very long time, a lot of work is devoted to maintaining and repairing them.

Boilermakers work in industrial plants near boilers, vats, tanks and other vessels. They may also work at the construction site of these vessels. Boilermakers work indoors in workshops or factories, and outdoors on construction sites. The work can be dangerous since they may have to work at considerable heights and/or around dangerous heavy equipment.

### Demanding aspects:

- Working in cramped positions.
- Working in a noisy, hot, poorly ventilated and/or damp environment.
- Losing work time (and wages) during bad weather conditions.
- Working overtime or sometimes at night.

### Requirements:

A Boilermaker should:

- Be at least 18 years old.
- Physical fit
- Undergo aptitude test
- Meet all vetting requirements as set by the Company (no criminal record)
- Have some insight into electrical engineering.
- Have mechanical aptitude.
- Be practical and accurate.
- Be responsible, alert and careful.
- Enjoy working with their hands.
- Work well with others.
- Be able to concentrate under noisy working conditions.
- Have physical strength, stamina and flexibility.
- Have good hand-eye coordination.

- Have manual dexterity.
- Have good eyesight.

Entry requirements:

You will need to obtain an N2 qualification. If you have passed grade 12 with a science and maths pass rate of more than 40%, you will only need to write and pass 2 of the 4 subjects (Engineering Drawing and Trade Theory) to obtain your N2 qualification. If you have not passed the grade 12 science and maths exam, then you would need to enrol for all 4 subjects (Maths, Engineering Science, Engineering Drawing and Trade Theory) to obtain your N2 qualification.

Possible career advancement opportunities:

- Engineering foreman.
- Maintenance overseer.

**Rigger**

Riggers erect hoisting tackle, assemble and erect derricks or sheer legs for construction purposes and install and maintain steel cables and ropes. They also assist in erecting chimneystacks, large buildings, heavy machinery, etc.

Before objects are handled, riggers calculate their weight and ascertain the best way of securing and moving them. Riggers are responsible for the inspection, lubrication and maintenance of all types of lifting tackle, including cranes, derricks, driving winders, jacks, hoists and manually operated lifting equipment. They need to have sound knowledge of scaffolding, platforms and tripods.

They play important roles in all branches of heavy industry. They may work in workshops, underground in mines, on ground level or hundreds of metres up in the air. This job can often be very dangerous. Riggers are seldom stationary while working. They are continually moving about, climbing and working in all possible positions and locations.

Satisfying aspects:

- The non-routine nature of the work.
- The challenge each job presents.
- Varied employment possibilities.
- Good remuneration.

Demanding aspects:

- An element of danger involved in the work.
- Sometimes working in dirty conditions.
- Having to work shifts or overtime or far away from home.

Requirements:

A Rigger should:

- Be at least 18 years old.
- Physical fit
- Undergo aptitude test
- Meet all vetting requirements as set by the Company (no criminal record)
- Be mentally and physically sound and healthy.
- Possess endurance and stamina.
- Not be afraid of heights.
- Be responsible and safety conscious.
- Be able to work quickly and efficiently.
- Be willing to do hard physical work.

### Entry requirements:

You will need to obtain an N2 qualification. If you have passed grade 12 with a science and maths pass rate of more than 40%, you will only need to write and pass 2 of the 4 subjects (Engineering Drawing and Trade Theory) to obtain your N2 qualification. If you have not passed the grade 12 science and maths exam, then you would need to enrol for all 4 subjects (Maths, Engineering Science, Engineering Drawing and Trade Theory) to obtain your N2 qualification.

### Possible career advancement opportunities:

- Foreman.
- Maintenance foreman.
- Maintenance overseer.

## **Auto Electrician**

An auto electrician is typically a specialised type of mechanic that focuses primarily on repairing and modifying the electrical systems of cars and trucks.

Automotive electricians often have specialised training and knowledge, and many general automotive technicians can diagnose and repair certain electrical systems. In many cases, automotive electric repair shops will also be able to repair or rebuild components such as starter motors and alternators.

It is also common for these specialist technicians to operate the equipment and have the knowledge to handle the computerised systems present in many modern vehicles.

Diagnosing and repairing various electrical problems is often a large part of an automotive electrician's job. This can result in a sizable variety of potential issues, because the electrical system of a modern vehicle typically includes a charging system and battery, several complex accessories, and even computerised components.

### Satisfying aspects:

- A variety of work tasks.
- The opportunity to specialise.
- The challenge each job presents.
- Solving problems.

### Demanding aspects:

- Working in awkward or cramped positions.
- Working overtime or at night.
- The possibility of eyestrain resulting from doing detailed work.

### Requirements:

An Auto Electrician should:

- Be at least 18 years old.
- Physical fit
- Undergo aptitude test
- Meet all vetting requirements as set by the Company (no criminal record)
- Be accurate and patient in doing complicated work.
- Have dexterity and steady hands.
- Have good eyesight and colour vision.
- Communicate effectively with fellow workers.

### Entry requirements:

You will need to obtain an N2 qualification. If you have passed grade 12 with a science and maths pass rate of more than 40%, you will only need to write and pass 2 of the 4 subjects (Engineering Drawing and Trade Theory) to obtain your N2 qualification. If you have not passed the grade 12 science and maths exam, then

you would need to enrol for all 4 subjects (Maths, Engineering Science, Engineering Drawing and Trade Theory) to obtain your N2 qualification.

Possible career advancement opportunities:

- Workshop foreman.
- Maintenance overseer.
- Maintenance manager.

**Instrument Mechanician**

An instrument mechanic manufactures, and repairs instruments and recalibrates old instruments. The instrument mechanic plays a vital role in ensuring that automatic processes and plant systems operate correctly and efficiently.

The control of nearly all manufacturing processes depends on instruments that could be electrical, mechanical or hydraulic, which are responsible for measuring the pressure, temperature, position, level, mass or flow of solids, fluids and gases. Should the plant processes not operate according to specifications, the instrument mechanic diagnoses the fault and carries out repairs as quickly as possible.

Instrument mechanics are trained to design, manufacture and repair almost any kind of instrument, whether electrical, mechanical, hydraulic, chemical or optical. To design specific research instruments, these mechanics work according to sketches and instructions from scientists and engineers.

Satisfying aspects:

- The opportunity to specialise.
- A variety of work tasks.
- The challenge of designing new instruments.

Demanding aspects:

- The possibility of eyestrain resulting from doing detailed work.
- Working overtime during emergencies.
- Sometimes working in noisy, warm, humid or dangerous conditions.

Requirements:

An Instrument Mechanic should

- Be at least 18 years old.
- Physical fit
- Undergo aptitude test
- Meet all vetting requirements as set by the Company (no criminal record)
- Have mechanical insight.
- Have a good understanding of physics and mathematics.
- Be thorough and precise.
- Be accurate and patient in doing complicated work.
- Have initiative.
- Have dexterity and steady hands.
- Have good hand-eye coordination.
- Have good eyesight.
- Be able to work under pressure.

Entry requirements:

You will need to obtain an N2 qualification. If you have passed grade 12 with a science and maths pass rate of more than 40%, you will only need to write and pass 2 of the 4 subjects (Engineering Drawing and Trade Theory) to obtain your N2 qualification. If you have not passed the grade 12 science and maths exam, then you would need to enrol for all 4 subjects (Maths, Engineering Science, Engineering Drawing and Trade Theory) to obtain your N2 qualification.

Possible career advancement opportunities:

- Instrument technician.
- Foreman.
- Maintenance overseer.
- Control and instrumentation engineer (must complete relevant N6 subjects and an internship).



## Miners

Becoming a miner is one of the core occupations in the Mining and Minerals Sector and a sought-after qualification. In general, miners are responsible to extract diamond bearing ore according to production plans. This involves several tasks, including the operation and maintenance of sophisticated drilling and hauling equipment, controlling of blasting operations, working with explosives, supporting mining excavations and testing for gases. All these tasks need to be performed with the greatest level of safety consciousness. Miners spend most of their time working underground in hot and confined environments, where a lot of stamina and physical fitness are required. Miners are required to effectively lead their teams and manage their resources to achieve production targets.

Miners are trained through full-time learnerships, involving theoretical training, practical training and workplace learning which culminate in an integrated assessment. Thereafter, successful candidates receive an MQA qualification at NQF Level 3 and a Blasting Certificate from the Department of Mineral Resources (DMR). Various qualifications exist for different types of mines, e.g., open-pit surface mines, underground coal mines and underground hardrock mines. You may have to consider your preferred work environment before selecting which qualification is appropriate for you.

### Satisfying aspects:

- A variety of tasks.
- Varied employment possibilities.
- Working with your hands.

### Demanding aspects:

- Working in noisy, warm, humid or dangerous conditions.
- Physical demands such as standing, bending and crouching can be tiring.
- Working underground.

### Requirements:

A miner should

- Be at least 18 years old.
- Physical fit
- Undergo aptitude test
- Meet all vetting requirements as set by the Company (no criminal record)
- Be responsible and safety conscious.
- Be able to work under pressure.
- Be willing to do hard physical work.
- Have technical aptitude.
- Have good communication skills.
- Have stamina and perseverance.

Entry requirements:

- Grade 12
- Compulsory subjects: Mathematics, Physical Science or Foundational Competency Assessment levels that allow for continued study.

Possible career advancement opportunities:

- Shift Boss.
- Mine Overseer
- Section Manager



## Professional Career Options

The Mining and Minerals Sector has many work opportunities for technical professionals in the mining, mechanical, electrical and metallurgical engineering fields. The sector also employs professionals such as:

- Electrical Engineers
- Mechanical Engineers
- Mining Engineers
- Metallurgist
- Surveyor
- Geologists
- Environmental Manager
- Occupational Health and Safety Managers

This sector also needs many non-technical personnel to provide financial, human resource, legal, training and development and other services.

### Mining Engineer

Mining engineering involves economically removing ore from the earth and delivering it in a manageable form to the extraction metallurgist for processing. The mining engineer is skilled in the knowledge of mining processes and must, through knowledge and experience:

- Be conversant with surveying shaft sinking, tunnelling practices, blasting and sequencing the extraction of the ore body as well as rock mechanics, mine ventilation, and general engineering.
- Have a working knowledge of the strength and stability of mining excavations.

The selection of the correct mining method is one of the mining engineer's most important functions. Mining engineers must understand the environmental problems in working underground, where ventilation, cooling of air and water, testing for methane, and provision of services such as power and water are essential for the productivity, safety and well-being of the workplace. It is also important for the mining engineer to be aware of the impact of the mining process on the environment and to be able to plan for restoration of the mining area so that it can be rehabilitated.

Whether on the surface or underground, the mining engineer works closely with the geologist, surveyors, electrical and mechanical engineers and the mine surveyor to ensure that the mining operation is well planned and efficient, and that waste or overburden does not dilute or contaminate the ore destined for the extraction process.

## Mine Manager’s Certificate

To be legally appointed as a mining manager in terms of the Mine Health and Safety Act, a junior mining engineer with a Blasting Certificate and a Mine Overseer’s Certificate and at least 2 years (500 shifts) appropriate post qualification practical experience (in relevant class of mine), must apply to the Chief Inspector (DMR) for acceptance to write his/her MMC. Once accepted, they must pass the three prescribed examinations –

- Part A: Geology, Surveying and Engineering
- Part B: Mining Technologies and Mining Management
- Part C: Legal Knowledge.

### Mining engineer learning options

	<b>Diploma Option</b>	<b>BTech Degree Option</b>	<b>Degree Option</b>
<b>NQF Level</b>	<b>NQF 6</b>	<b>NQF 7</b>	<b>NQF 8</b>
Qualification	National Diploma: Mining Engineering	BTech: Mining Engineering	BSc (Eng) Mining Engineering or BEng Mining Engineering
Duration	3 Years	1 Year	4 Years
Minimum Entry Qualifications	Grade 12 Certificate or equivalent with Maths and Physical Science on Higher Grade both with minimum pass of E Symbol or Standard Grade D Symbol	National Diploma: Mining Engineering	Grade 12 Matriculation with exemption, Maths and Physical Science on Higher Grade both with minimum pass of D Symbol
Subjects	Grade 12 Maths and Science OR N2 Trade Theory + another N2 subject	Mining Engineering Subjects	Mathematics and Physical Science
Further Training and Professional Registrations and Associations	2 years post qualification practical training is required before a person may obtain a Mine Manager’s Certificate of Competency.	2 years post qualification practical training is required before a person may obtain the Mine Manager’s Certificate of Competency. If desired, a period of 2 years or 3 years practical training is required before a person may register as a Professional Engineer (Pr. Eng) or Professional Engineering Technologist (Pr.Tech. Eng) respectively with the Engineering Council of South Africa (ECSA).	

## Mechanical Engineer

Mechanical engineers research, develop, design, manufacture, and maintain machines, machine components and systems in various fields of application.

Mechanical engineering in the mining context: The wealth-producing minerals and mining industry is one of the sectors where great demands are made on the initiative of the mechanical engineer. Pumping plants, hauling machines, winding equipment, ventilation fans, conveyor belts, drilling machines and underground railways are a few of the devices that require the input of a mechanical engineer.

Mechanical engineers work on projects from the initial brief, through the design and development stages to the testing of one or more prototypes and onto final implementation. Their working hours typically include regular extra hours, but not usually weekends or shifts. The work is mainly office-based with regular visits to plants/mines/workshops and sites. Plant areas and mines can be noisy, and work is often according to deadlines. Engineering graduates usually begin work under the supervision of experienced engineers and are gradually given more responsibilities as they gain experience.

### Government Certificate of Competency

To be legally appointed as an engineer in terms of the Mine Health and Safety Act, a junior electrical engineer (heavy current) or junior mechanical engineer with a degree or diploma and at least 2 years appropriate post qualification practical experience, must apply to the Chief Inspector (DMR) for acceptance as a candidate. Once accepted, they must pass the two prescribed subjects: Plant/Mining Engineering and Legal Knowledge. Persons registered as Professional Engineers with ECSA may be exempted from the Plant Engineering paper.

### **Mechanical engineer learning options**

	<b>Diploma Option</b>	<b>BTech Degree Option</b>	<b>Degree Option</b>
<b>NQF Level</b>	<b>NQF 6</b>	<b>NQF 7</b>	<b>NQF 7-8</b>
Qualification	National Diploma: Mechanical Engineering	BTech: Mechanical Engineering	BSc (Eng) Mechanical Engineering or BEng Mechanical Engineering
Duration	3 Years	1 Year 2 Years part time	4 – 5 Years
Minimum Entry Qualifications	Grade 12 Certificate or equivalent with Maths and Physical Science on Higher Grade both with minimum pass of E Symbol or Standard Grade D Symbol	National Diploma: Mechanical Engineering	Grade 12 Matriculation with exemption, Maths and Physical Science on Higher Grade both with minimum pass of D Symbol.
Subjects	Grade 12 Maths and Science OR N2 Trade Theory + another N2 subject	Mechanical Engineering Subjects	Mathematics and Physical Science
Further Training and Professional Registrations and Associations	Afterwards, a period of 2 years practical training is required before a person may write the Government Certificate of Competency (GCC).	Afterwards, a period of 2 years practical training is required before a person may obtain a GCC; 3 years' experience is required to register as a Professional Engineering Technologist Pr.Tech.Eng with the Engineering Council of South Africa (ECSA).	Afterwards, a period of 2 years practical training is required before a person may obtain a GCC OR register as a professional engineer Pr.Eng. with the Engineering Council of South Africa (ECSA).

### **Electrical Engineer**

An electrical engineer research, designs, installs, and tests electrical and electronic equipment and supervises its manufacturing. Their work involves the generation, distribution and management of all appliances and installations that generate or use electrical energy.

The fact that there are so many varieties and sources of electrical power means that there are also numerous areas of specialisation in the field of electrical engineering. Specialisation may also include the design of electrical transmission systems, electric motors and generators, high-voltage engineering and power electronics, to name but a few. The nature of the work may include research and design of new products, the writing of performance requirements and the development of maintenance schedules. Electrical engineers test equipment, solve operating problems and estimate the time and cost of engineering projects.

Many electrical and electronics engineers also work in areas closely related to computers.

There are various similarities although also differences, between electrical and electronics engineering. Electronics engineering is often referred to as “light current” engineering and electrical engineering as “heavy current” engineering. The difference lies in terms of the storage, retrieval, transfer and processing of information associated with electronics engineering, versus the application of electrical energy associated with electrical engineering, which is now split into heavy and light current engineering. However, there is some blurring between the two areas in today’s world and career handbooks prefer to describe electronics engineering as a sub-division of electrical engineering.

Government Certificate of Competency

To be legally appointed as an engineer in terms of the Mine Health and Safety Act, a junior electrical engineer (heavy current) or junior mechanical engineer with a degree or a diploma and at least 2 years appropriate post qualification practical experience, must apply to the Chief Inspector (DMR) for acceptance as a candidate. Once accepted, they must pass the two prescribed subjects: Plant/Mining Engineering and Legal Knowledge. Persons registered as Professional Engineers with ECSA may be exempted from the Plant Engineering paper.

**Electrical engineer learning options**

	<b>Diploma Option</b>	<b>BTech Degree Option</b>	<b>Degree Option</b>
<b>NQF Level</b>	<b>NQF 6</b>	<b>NQF 7</b>	<b>NQF 7-8</b>
Qualification	National Diploma: Electrical Engineering	BTech: Electrical Engineering	BSc (Eng) Electrical Engineering or BEng Electrical Engineering
Duration	3 Years	1 Year full time 2 Years part time	4 Years
Minimum Entry Qualifications	Grade 12 Certificate or equivalent with Maths and Physical Science on Higher Grade both with minimum pass of E Symbol or Standard Grade D Symbol	National Diploma: Electrical Engineering	Grade 12 Matriculation with exemption, Maths and Physical Science on Higher Grade both with minimum pass of D Symbol
Subjects	Grade 12 Maths and Science OR N2 Trade Theory + another N2 subject	Electrical Engineering Subjects	Mathematics and Physical Science
Further Training and Professional Registrations and Associations	Afterwards, a period of 2 years practical training is required before a person may write the Government Certificate of Competency (GCC).	Afterwards, a period of 2 years practical training is required before a person may obtain a GCC; 3 years’ experience is required to register as a Professional Engineering Technologist Pr. Tech.Eng with the Engineering Council of South Africa (ECSA).	Afterwards, a period of 2 years practical training is required before a person may obtain a GCC OR register as a professional engineer Pr.Eng. with the Engineering Council of South Africa (ECSA).

**Metallurgist**

The metallurgical profession is diverse, with metallurgists employed in a range of industries and enterprises that produce, buy, sell, refine or manufacture metals and metallic products. Metallurgists develop ways of processing metals and converting them into useful goods. Extraction metallurgists specialise in the extraction of metals and minerals from mine ores. Often, only a tiny amount of the precious metal is deposited in the ore. The metallurgist is expected to remove all the metal in an efficient and economical way. They control and

design process improvements to optimise the recovery of the metals and minerals from the ore. Metallurgists often inspect metallic materials and equipment for quality and advise on failure prevention, improvement, repairs and replacement. Metallurgists need to have knowledge of a variety of mineral processing plants that are efficient and economical to run.

Production metallurgists are experts on the treatment process for which they are responsible and must manage their workforce to ensure the smooth operation of the metallurgical plant.

### Metallurgical engineer learning options

	Diploma Option	BTech Degree Option	Degree Option
NQF Level	NQF 6	NQF 7	NQF 7-8
Qualification	National Diploma: Metallurgical Engineering	BTech: Metallurgical Engineering	BSc (Eng) or BEng Metallurgical Engineering
Duration	3 Years	1 Year full time 2 Years part time	4 – 5 Years
Minimum Entry Qualifications	Grade 12 Mathematics and Science and APS as stipulated by that university	National Diploma: Metallurgical Engineering	Grade 12 Matriculation with exemption, Maths and Physical Science on Higher Grade both with minimum pass of D Symbol.
Subjects	University syllabus	Metallurgical Engineering Subjects	Mathematics and Physical Science
Further Training and Professional Registrations and Associations	Afterwards, a period of 2 years practical training is required before a person may write the Government Certificate of Competency (GCC).	Afterwards, a period of 2 years practical training is required before a person may obtain a GCC; 3 years' experience is required to register as a Professional Engineering Technologist Pr. Tech. Eng with the Engineering Council of South Africa (ECSA).	Afterwards, a period of 2 years practical training is required before a person may obtain a GCC OR register as a professional engineer Pr. Eng. with the Engineering Council of South Africa (ECSA).

### Geologist

Mineral/mining geologists are experts regarding ways to find and extract minerals, including metalliferous, industrial and bulk minerals and coal.

Usually, the geologist's involvement in a project begins at their desk. They may decide on an area for a new exploration programme by using aerial photographs, field maps, or data from geophysical and geochemical surveys.

Geologist's study mineral deposits and the processes leading to their formation. This information is extremely useful to mining companies as it helps them to locate and understand the nature of the resources, they are mining.

Some geologists use data collected in fieldwork to find new ways of developing and interpreting models. Once mining has begun, geologists are closely involved in the extraction process. They constantly review incoming data, e.g., core samples collected by drilling. Geologists frequently check the quality of the minerals and make decisions about unexpected problems like rock faults and groundwater.

Mineral's Geologists are highly experienced professionals who may work in the financial sector, advising banks and other lenders on proposed mining projects, where finance is being sought. Geologists may also work as researchers, teachers and advisers in mining tourism.

### Geologist learning options

	Diploma Option	BTech Degree Option	Degree Option
<b>NQF Level</b>	<b>NQF 6</b>	<b>NQF 7</b>	<b>NQF 7-8</b>
Qualification	National Diploma: Geology	BTech: Geology	BSc (Eng) or BEng Geology/Hons
Duration	3 Years	1 Year full time 2 Years part time	4 – 5 Years
Minimum Entry Qualifications	Grade 12 Mathematics and Science and APS as stipulated by that university	National Diploma: Geology	Grade 12 Matriculation with exemption, Maths and Physical Science on Higher Grade both with minimum pass of D Symbol
Subjects	University syllabus	Geology Subjects	Mathematics and Physical Science

### Geotechnical Engineer

Geotechnical or rock engineering is the discipline of designing and supporting stable excavations in rock. By understanding the properties of the rock quantitatively as well as qualitatively the design of stable excavations in mines is made possible.

In addition, geotechnical engineering entails an understanding of available support types and their performance. This is used to select the optimum support required for the stability of excavations considering the relevant factors such as safety, length of service and economics.

Rock engineering also includes a working understanding of mining induced seismicity, including mechanisms, mine layout to minimise seismicity and support to minimise rock burst damage.

Rock engineering has played a crucial role in helping to exploit the underground mineral wealth present in South Africa. Many rock engineers are graduates in science or engineering and others are even qualified as mining engineers.

The legally recognised qualification is the Chamber of Mines Rock Mechanics Certificate which is administered by UNISA and overviewed by the South African National Institute for Rock engineering (SANIRE).

Geotechnical engineering is therefore a specialist direction that can be based on one of the following initial degrees:

- Geology
- Mining engineering
- Engineering geology

Graduates will complete an internship specialising in geotechnical engineering by preparing for and completing the Chamber of Mines Rock Mechanics Certificate.

### Surveyor

Surveyors within the Mining and Minerals Sector are experts in mine surveying methods, mine planning, geology, mine valuation and finances.

They carry out surveys to gather information for mine planning by measuring and observing, using special surveying equipment and methods, and taking ore samples. By carrying out the surveys, mine surveyors are able to work out and map the position, structure and size of the most profitable areas to mine for mineral deposits by mining cartography (mine plans). They assist with buying, leasing, selling and the management of mineral properties.

Mine surveyors are responsible for measuring the areas and volumes blasted by underground crew on a daily basis and keeping mine plans and information updated to allow for safe, economical mine planning and management. Their plans help new mines to avoid older ones which may have flooded and allowed new connections to be made between underground passages in the mine.

Furthermore, a mine surveyor studies and predicts the effects that mining will have on the environment and plans methods for rehabilitation of the land after it has been mined, in collaboration with government planning authorities. Mine surveyors spend their mornings carrying out routine underground surveys and their afternoons on surface studying their findings, entering them into the computer, doing calculations and updating the plans of the mine. They are also responsible for measuring how much work the mining contractors have done underground and calculating payments due to them.

### Surveyor learning options

	<b>Diploma Option</b>	<b>BTech Degree Option</b>	<b>Degree Option</b>
<b>NQF Level</b>	<b>NQF 6</b>	<b>NQF 7</b>	<b>NQF 7-8</b>
Qualification	National Diploma: Mine Surveying OR N Dip (Minerals Surveying)	BTech: Mine Surveying OR BTech: Mineral Resource Management	BSc Geomatics OR BSc Land Surveying
Duration	3 Years	1 Year full time 2 Years part time	4 – 5 Years
Minimum Entry Qualifications	Grade 12 Certificate or equivalent with Maths and Physical Science on Higher Grade both with minimum pass of D Symbol or Standard Grade B Symbol, OR N3 or N4 Cert. with 60% in Engineering Mathematics & Engineering Science	National Diploma: Mine Surveying or equivalent qualification	Grade 12 Matriculation with exemption, Maths and Physical Science on Higher Grade both with minimum pass of D Symbol
Subjects	Recommended Subjects: Computer Applications Technology, Geography and Information Technology	National Diploma: Mine Surveying Courses	Mathematics and Physical Science
Further Training and Professional Registrations and Associations	Prescribed experience and a Law Examination prior to registration with the South African Council for Professional and Technical Surveyors (PLATO).	Prescribed experience and a Law Examination prior to registration with the South African Council for Professional and Technical Surveyors (PLATO).	Prescribed experience and a Law Examination prior to registration with the South African Council for Professionals and Technical Surveyors (PLATO).



## Financing Your Studies

### Bursaries

Bursaries are generally aligned to specific courses of study and/or institutions. Tertiary institutions have bursaries financed by donations and/or companies. Learners are often interviewed to make sure they suit the future employment requirements of the sponsoring company. The learner might be required to work for that company for a specific period after completion of the course. Note that bursaries are not always given to the neediest learner; academic merit is also considered when a bursary is awarded.

#### Ekapa bursaries:

Ekapa offers bursaries to learners from local communities to obtain tertiary qualifications relevant to the Mining and Minerals Sector.

#### Bursaries are offered to learners:

- Who meet the minimum University of Technology entry requirement
- Who come from low-income households
- Are citizens of South Africa

#### Bursaries cover the following:

- Full tuition fees.
- Accommodation and meals.
- Annual allowance which also covers travel and books.

Note: Ekapa does not pay for repeating subjects.

#### How to apply:

Complete the bursary scheme application form that you can obtain from the EKAPA website and attach the following documents:

- Certified copies of grade 11 results.
- Certified copies of year-to-date grade 12 results.
- If the candidate is already studying, attach latest tertiary results.
- Certified copy of identity document.
- Complete/attach any other requirements with application form.

Advertisements will be made annually.

Note: The bursary holder will be required to do vacation work with the company or an associated company at the end of each academic year to meet the university curriculum requirements.

### Important points to remember:

- Know by at least grade 10 what you intend to study.
- Choose the correct subjects.
- Seek career guidance.
- Apply in time with tertiary institutions. All tertiary institutions have different closing dates.
- Remember the goal and work hard.

### **Ekapa scholarships and school support:**

Ekapa currently offers support to help scholars in local mining communities to improve the level and quality of their education as well as to gain access to careers in the mining industry. This process starts at school level.

### **Scholarship**

Ekapa offers scholarships to deserving learners from disadvantaged households in local mining communities to achieve good Grade 12 results and thus be in a positive position to follow a successful career.

### Scholarship funding can take the form of one or a combination of the following:

- Payment of school fees as per the official school fee structure
- Payment for prescribed textbooks, stationery and equipment (proof of requirement to be provided by educational institution)
- Payment for school uniform
- Payment of cost related to one field of extracurricular activity in which the scholar excels
- Application fees for universities

### Learners are eligible to apply who:

- Study Mathematics and Physical Science and achieve at least 60% for both subjects;
- Achieve an average of 70% for all subjects; and
- Have a good disciplinary record.

### **School Support**

South Africa is ranked 2nd last in the world when it comes to mathematics and science performance in schools. This is due to many contributing factors.

To help bridge the gap, Ekapa is currently offering tuition in the following areas to selected local schools from disadvantaged communities:

- Mathematics tuition.
- Physical Science tuition.

### Tuition is offered to:

- Educators who need tuition for personal development and upskilling.
- All grade 10 – 12 learners studying Mathematics and Physical Science