KNOW THE CAREER WORLD

Manufacturing Careers

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ISBN: 978-0-7974-7085-9

A LASOF Careers Institute Publication

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Printed in Zimbabwe

A product of

LASOF Careers Institute Publications

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Purposeful Career Planning

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DEDICATION

I dedicate this book to the millions of teenagers in and from the African continent. May your lives be consumed by a deep desire to build leadership legacies that will unlock Africa's potential and greatness. Africa is too rich to be poor. You were born for a purpose. You were born to leave Africa a better continent than you found it. Don't disappoint and don't settle for less.

Acknowledgements

No task of this magnitude can ever be achieved without divine wisdom and knowledge. I would like to first and foremost acknowledge the LORD Almighty for granting me the love to inspire and empower my generation.

Writing is time consuming and requires a lot of support from the family. My life has been blessed with a loving wife and supportive purpose partner Shingie. For close to the three decades that I have known her, she has supported me through thick and thin, highs and lows and has been the most loving and inspirational person I have known in my life time. I would like to also acknowledge the unflinching encouragement I have received from my loving and dear children Tinashe Charles Jr, Tendaishe and Takundanashe. My wider family and friends have been great and deserve special mention.

I would like to also acknowledge the inspiration and motivation that I have received over the years from the legacy building individuals that I have worked with in the Church community, at the University of Zimbabwe and at LASOF Leadership Institute. Our journey together of inspiring and empowering thousands of learners to make purposeful career choices and become character based leaders ignited the desire and vision for this career guidance series.

Each learner, parent, school, company, government department, Church or NGO who came through our career and leadership programs in Zimbabwe and the wider African region has inspired us to continue the journey and they deserve special acknowledgement. You each made me believe this was a worthwhile cause.

Special acknowledgement goes to the Joshua Nkomo Scholarship Fund. The opportunity you granted us to develop the career and leadership capacity of your scholarship beneficiaries (the Joshualites) over the last ten years has been truly a mutually enriching experience which went a long way in inspiring me to write these books.

Introduction

The career world is diverse and dynamic. Before you make a career choice, it is important that you have an appreciation of the width and depth of the career world in terms of options that are available.

A career is a chosen pursuit, a profession or occupation requiring special training, followed as one's lifework. It is a path or course one chooses to follow to earn a living. It is the progression of one's working life or one's professional achievements, for instance a soldier or a teacher. A career is a course of successive situations that make up a person's occupation. A career is therefore doing what one does as a permanent occupation.

The term career is derived from the Latin word *carrera,* which means race. The verb was first attested in 1594 from the notion of a horse "passing a career" on the jousting field. A career is usually considered to pertain to remunerative work and formal education. One can have a sporting career or a musical career without being a professional athlete or musician, but most frequently "career" in the 20th century referenced the series of jobs or positions by which one earned one's money.

Career Cluster is a broad group of related career majors within an occupational interest area. They represent groupings of occupations and industries based on shared traits. There are sixteen (16) career clusters that cover all occupations.

This book focuses on the Agriculture, Food and Natural Resources career cluster.

Perspectives on career planning

One of the most important choices you have to make in your life time is selecting a career. This choice has far reaching implications and it has to be an informed choice. The quality of information you have determines the quality of decisions you make. This book is a tool designed to empower you to make an informed career choice that you won't regret in the future. In this introduction, we are going to share some perspectives that you need to take into account as you make use of this book.

Purpose perspective to career planning

Take a moment and think of the best footballer in your nation. Think also about your favourite local musician. Can you imagine the two of them switching places? How do you think the footballer would perform on the music stage and the musician in the football field?

We were all created and designed to fulfil a specific purpose in life. None of us was created to do everything. You have a life purpose that will bring out your best. That purpose is your life assignment. You need to choose a career that is aligned to that assignment. In fact your career should be an expression of that assignment. The platforms for expressing your purpose may vary from one season to another but the assignment itself does not change. Its expressions may also change but your purpose will remain a constant factor in life.

Many professionals today are not fulfilled and satisfied with their careers mainly because of a lack of purpose perspective in the manner they selected their careers. Your career should be an expression of who you are and it must be an opportunity for you to utilize your gifts, talents, passions and other latent abilities. This is why you must first know yourself well before you make your career choice. This question of self-knowledge is fully addressed in the book "Know Yourself: A Foundation for Career and Character Development" which is the first book in the Career Education series.

Dynamic perspective to career planning

You also need to appreciate the career world is so dynamic and ever changing. Did you know for example, that the top ten jobs in the world in 2010 did not exist in 2004? You need to be aware that some of the jobs that are on demand today may not be relevant in the future. Can you imagine what is happening to someone who invested all their time in developing a career that has to do with manufacturing or repairing manual type writers?

The dynamism of the career world means you need to be prepared to continuously develop new knowledge and skills that are relevant to the ever changing career world. Multi skilling is also important as you will have to adapt to the changing socio economic and political environment.

Please note the career listing in this book is not exhaustive. There are other careers that are not mentioned in this book under this career cluster. The ones listed here are only samples.

Local perspective to career planning

When making a career choice, invest effort in developing an understanding of the economic environment in your country as it has a direct bearing on the labour markets. You don't want to spend years developing knowledge and skills in an area where there are limited or no

employment prospects. You need to have some insights in terms of employment trends in your local job market.

For example, a country like Zimbabwe did not have diamond mining until a few years ago. Today, however, diamond mining is redefining the economic terrain in ways that have far reaching implications in terms of new career opportunities. Diamond cutting, for example, is a new career pathway that had never been explored before but that is becoming a major area of employment opportunity as Zimbabwe has the fourth largest diamond deposits in the world. We have other examples of countries in countries that have discovered oil deposits like Ghana. Such developments have far reaching economic implications that are reflected in new career opportunities.

Global perspective to career planning

We encourage all learning to also develop knowledge and an appreciation of regional and global economic and employment trends. There is a lot of migration of skills across nations and continents. Developments in other parts of the world will have some bearing on developments in your nation as well. It is wise to have a global perspective even when you are deciding to pursue your career locally.

In this book, we have looked at the Career world from both an African and global perspective. There will be many careers you may see that you have not heard about before. Some of them may be in your country but you have not been aware of it. Other listed careers may not be found in your country. This broad view should help you to appreciate local, regional and global trends in terms of the career world.

Entrepreneurial perspective to career planning

The rate of unemployment has been growing across the nations of Africa and the world. There is need to rethink the traditional approach to career planning and employment. It is important to observe that in most African nations the informal or Small to Medium Enterprises (SMEs) sector is growing rapidly. Many people are creating jobs for themselves and others instead of seeking and waiting for non-existent employment opportunities.

As you plan your career, you need an entrepreneurial perspective where you see yourself as a prospective employer not just an employee.

Contents

Manufacturing Career Pathways and Sample Careers

Focus: Planning, managing and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance and manufacturing/process engineering.

Cluster Summary: Careers in the Manufacturing cluster involve turning raw materials into final consumer products. People in these occupations can work with big machines, precision tools and computers to assemble parts or build products. They may work in large buildings, outdoors or in warehouses. You can be many types of engineer, machine operator, electrician or quality control technician and be in this career cluster.

Career Pathways	Sample Careers
Production	•Assembler •Automated Manufacturing Technician •Bookbinder •Calibration Technician •Electrical Installer and Repairer •Electromechanical Equipment Assembler •Extruding and Drawing Machine Setter or Set-Up Operator •Extrusion Machine Operator •Foundry Worker •Grinding, Lapping, and Buffing Machine Operator •Hand Packers and Packager •Hoist and Winch Operator •Instrument Maker •Large Printing Press Machine Setter and Set-Up Operator •Machine Operator •Manager, Supervisor •Medical Appliance Maker •Milling Machine Setter •Set-Up Operator •Millwright Operator •Tender •Cutter or Brazer, •Solderer, Machine Operator •Painter •Pattern & Model Maker •Precision Layout Worker •Precision Optical Goods Worker •Production Associate •Sheet Metal Worker •Solderer and Brazer •Tool and Die Maker •Welder
Manufacturing Production Process Development	•Design Engineer •Electrical and Electronics •Technician and Technologist •Electronics Engineer •Engineering and Related Technician and Technologist •Engineering Technician •Industrial Engineer •Labour Relations Manager •Manufacturing Engineer •Manufacturing Technician •Power Generating and Reactor Plant Operator •Precision Inspector, Tester, and Grader •Process Improvement Technician •Production Manager •Purchasing Agent •Supervisor
Maintenance, Installation & Repair	•Biomedical Equipment Technician •Boilermaker •Communication System Installer/Repairer •Computer Installer/Repairer •Computer Maintenance Technician •Electrical Equipment Installer/Repairer •Facility Electrician •Industrial Electronic Installer/Repairer

	•Industrial Facilities Manager •Industrial Machinery Mechanic •Industrial Maintenance Electrician •Industrial Maintenance Mechanic •Industrial Maintenance Technician •Instrument Calibration and Repairer •Instrument Control Technician •Job or Fixture Designer •Laser Systems Technician •Maintenance Repairer •Major Appliance Repairer •Meter Installer or Repairer •Millwright Plumber, Pipefitter and Steamfitter •Security System Installer or Repairer
Quality Assurance	•Calibration Technician •Inspector •Lab Technician •Process Control Technician •Quality Control Technician •Quality Engineer
Logistics & Inventory Control	•Communications, Transportation and Utilities Manager •Dispatcher •Freight, Stock, and Material Mover •Industrial Truck and Tractor Operator •Logistical Engineer •Logistician •Material Associate •Material Handler •Material Mover •Process Improvement Technician •Quality Control Technician •Traffic Manager •Traffic, Shipping, and Receiving Clerk
Health, Safety and Environmental Assurance	•Environmental Engineer •Environmental Specialist •Health and Safety Representative •Safety Coordinator •Safety Engineer •Safety Team Leader •Safety Technician

Career 1: Assembly Line Workers

Assembly line workers are responsible for performing one task or a set of tasks in an assembly process. Assembly lines are found in various factories where products being manufactured consist of a number of components assembled to form a complete unit.

Assembly line workers usually stand alongside a conveyor system, perform the necessary task, and allow the product to pass on to the next worker. Most assembly line work is performed by hand, but sometimes tools are used. Commonly used tools are screwdrivers, pliers, soldering irons and tools specifically designed for certain processes. A typical assembly line task is drilling holes in an item for screws and passing the item on for the next worker to fix the screws into the holes.

Some fulfilling and satisfying aspects of this career
- working as part of a team
- does not usually require high education level
- working with one's hands

Some demanding and challenging aspects of this career
- work can be very monotonous
- requires steady concentration for long periods
- some types of work can be stressful and tiring

Purpose Orientation
An assembly line worker should:
- be prepared to do repetitive work without getting bored or making mistakes
- be able to concentrate for long periods of time
- be able to work as part of a team
- be able to work to deadlines
- be prepared to work overtime
- manual dexterity
- have good eye-hand coordination
- be physically fit, although people with controlled epilepsy and orthopaedic impairments should also be able to do the work

School Subjects
Ordinary Level Certificate or Technical Certificate with literacy and numerical skills at level four.

Compulsory Subjects: None
Recommended Subjects: Physical Sciences

Training
Apprenticeship training.

Experienced workers train learner assembly line workers on the job. Each facet of the assembly process requires specialized training. Retraining is sometimes necessary when a worker is transferred.

Employer
- Metal factories
- Engineering factories
- Motor industry

Career 2: Bicycle Mechanics or Bicycle Technicians

Bicycle mechanics or bicycle technicians service and repair bicycles.

Bicycle mechanics assemble new bicycles that are delivered to a bicycle shop and check bicycles before they go on sale. They service and repair bicycles brought in by customers and advise customers about bicycle repair options, parts and accessories.

They may be responsible for updating and maintaining stock such as bicycle parts and accessories and could be involved in sales work and general shop duties such as answering the phone, serving customers and opening the shop.

Bicycle mechanics use tools such as screwdrivers, Allen keys, hand drills, grinders, spanners and wheel- tuning equipment.

As bicycle technology continually evolves, bicycle mechanics need to keep up-to-date with new components, equipment and tools. New technology and components tend to start at the high end of the market, often on racing bikes, and then become more widespread. Recent examples of this are the popularity of front, rear or seat post suspension on mountain bikes (a decade ago these were found mainly on racing models), and the increased use of hydraulic disc brakes in the past few years. Generally bikes have become more technically challenging to work on, although an ability to perform traditional tasks such as adjusting gears and brakes is still needed in this work.

Bicycle mechanics need good mechanical and problem-solving skills to repair bicycles and good communication skills to deal with customers. They need organizational skills to manage their day, as they may have to combine mechanic duties with shop duties. Bicycle mechanics needs to know how bicycles work, and how to repair and service them. They also need to know about bicycle accessories and components.

Bicycle mechanics have contact with shop customers and may work unsupervised or as part of a team, including sales staff, depending on the size of the shop. They usually work regular retail hours, including weekends, indoors in a bicycle shop. However, some mechanics work long and irregular hours, especially in their own business or when on tour. Experienced bicycle mechanics may work for regional or national cycling teams on tour and then are likely to travel nationally and internationally.

Bicycles remain a popular form of leisure and transport and are more popular in summer, with a boost in bicycle sales around Christmas time. This often creates a seasonal demand for extra bicycle mechanics.

Most bicycle mechanics work for bicycle shops, often a large store or franchise. Previously the majority of bicycle mechanics were self-employed, concentrating on repair services. One of the results of this is that many bicycle mechanic positions now involve some degree of retail selling of bicycles.

Some fulfilling and satisfying aspects of this career
- working with your hands
- challenge of solving problems
- the possibility of national and international travel

Some demanding and challenging aspects of this career
- somewhat dirty work
- sometimes long hours
- some seasonal fluctuation, thus going through quiet periods

Purpose Orientation
- pleasant, outgoing personality
- ability to work well under pressure.
- good at working with your hands
- good mechanical and problem-solving skills
- good hand-eye coordination
- able to stand all day on shop or workshop floor

School Subjects
There are no specific educational requirements to become a bicycle mechanic.

Compulsory Subjects: None
Recommended Subjects: Mechanical Technology

Training
Bicycle mechanics usually develop their skills on the job. They may also attend courses run by bicycle manufacturers. Presently, training is mainly on the job.

Employer
- bicycle shops
- bicycle or bicycle parts manufacturers
- cycling teams and clubs
- large stores
- self-employment

Career 3: Billet Providers

Steel is provided in the form of metal bars called billets. The person responsible for supplying steel billets to the reheating furnace and the roller mills is called a billet provider.

Billet providers receive roll-release notes with the number, quality, and lengths of billets required for manufacturing a specific product. The required billets are then ordered by telephone and supplied to the roller mills.

Billet providers also check reports of shift mill recorders on the numbers and quality of billets unloaded, those stacked in the billet yard and those supplied to the reheating furnace during each shift. They compile stock reports indicating the tonnage of billets available in the billet yard. They receive reports on analyses from the laboratory and record this information.

Some fulfilling and satisfying aspects of this career
- working with your hands initially
- opportunities for advancement

Some demanding and challenging aspects of this career
- frustrations in using the telephone and ensuring the correct amounts of billets are in stock
- repetitive work

Purpose Orientation
A billet provider should;
- be reliable and responsible;
- communicate well in speech and writing;
- maintain good human relations;
- have technical inclination;
- have mathematical ability;
- be physically fit.

School Subjects
Ordinary Level Certificate

Compulsory Subjects: None
Recommended Subjects: Metalwork

Training
Mostly training is undertaken on the job. Candidates must progress through the following stages:

billet yards man; first control driver; first heater; third roller; and finally shift mill recorder.

Employer
- Big Steel Manufacturers in various African countries

Career 4: Blacksmith/Farrier

Blacksmiths use modern mechanical tools and other machinery to manufacture objects from steel and metal e.g. architectural steel structures, crowbars and pickaxes.

They forge metal parts together, first heating the metal to soften it and then placing it on an anvil where it is hammered or pressed into the desired shape. Broken parts are re-joined by hammering them together. Blacksmiths often have to reheat objects to keep them workable while being shaped, repaired or finished. This process is used to sharpen metal or hand tools. Metal is tempered or hardened by heating to high temperatures and then cooling.

Some blacksmiths, called farriers, repair horseshoes using ready-made or custom-designed shoes. Farriers usually travel to stables to shoe horses, thus have somewhat more work variety than blacksmiths.

Other aspects of the work include making and interpreting detailed drawings. Blacksmiths need to be able to estimate material requirements from the drawings. They are also responsible for preparing, lighting and using open hearth, gas or oil-fired furnaces.

They usually work in hot, noisy workshops. Metal fabricating shops may provide power tools and the latest welding equipment, while local, small shops might use older equipment and methods. Blacksmiths do a lot of standing either upright or stooped, over their work. Sometimes the work involves lifting heavy metal objects.

Some fulfilling and satisfying aspects of this career
- working with your hands
- being creative
- some work can be very interesting
- farriers travel to many different stables and meet people

Some demanding and challenging aspects of this career
- having to concentrate for long periods
- may work in hot, noisy surroundings
- physically tiring with much bending, lifting and standing
- much patience required

Purpose Orientation
A blacksmith should:
- enjoy working with his hands;

- be imaginative;
- have good judgement;
- be a precise methodical worker;
- have an eye for shape and line;
- be patient when working with horses;
- have physical strength and stamina;
- have good hearing and vision.

School Subjects
Ordinary School Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: None
Recommended Subjects: None

Training
Apprenticeship training

Employer
- iron and steel manufacturers
- railroads
- mining industries
- machinery manufacturers
- small repair shops
- horse trainers, race track stables and horse owners
- self-employment

Career 5: Boat Builder, Shipwright and Marine Architects

Marine architects plan, design and supervise the construction and repair of ships, yachts and pleasure craft. Marine Architects are also known as Marine or Yacht or Boat Designers and Naval Architects. They may also be employed in the offshore industry, such as in the design and construction of oil-rigs.

Marine architects create or adapt the designs for ships, yachts or pleasure craft. After discussions with clients, professionals and government officials and having plans approved, they direct the preparation of drawings and written plans and prepare technical calculations and analyse dimensions of plans.

Marine architects conduct hydrodynamic (water pressures and flows) and structural computer-based testing. Particularly with larger vessels, physical scale modelling, or tank testing, is conducted.

They supervise the building of the craft and also modifications and repairs. Marine architects may also assist boat builders to work out how much the work will cost. Some are involved in new design work and research activities.

Marine architects need to have good design and technical skills, including skill at using computer-aided design (CAD) software, analysing information, mathematical ability and good written and spoken communication skills. They should also have drafting and sketching skills, and a reasonable understanding of boat-handling and/or boat-building requirements.

Marine architects need to know about the strength of boat materials and structures, shipbuilding, and marine standards and safety margins. They need to know about structural engineering, hydrodynamics (water pressures and flows) and aerodynamics (air pressure and flows) and the effect they can have on vessels.

Marine architects work in offices, workshops, on board vessels and at shipbuilding sites. They usually work regular hours, but as they are often self-employed their hours can also be flexible. Marine architects spend time working independently in front of a computer or at a drawing board, but generally work in teams with others such as clients, boat builders, their design teams and suppliers.

Boat builders and shipwrights:

Boat builders and shipwrights are responsible for building, altering, renovating, repairing, and

maintaining boats and ships. They are provided with a plan and specifications of the boat to be built or repaired. Alternatively, they are required to make their own designs and sketches.

Boat builders work mainly with wood, firstly selecting the material required for the job e.g. timber, plywood and hardboard, and then marking the design on the wood. They then cut and assemble the various parts to conform to the drawings using tools such as rulers, centre punches, scribes, and squares.

When all the parts have been shaped, they assemble them by making use of various kinds of joints such as dovetailed, dowelled, lapped, and tongued and grooved joints. Steam is used to bend the wood, the parts are then glued together and strengthened using nails, bolts, cleats and screws.

Boat builders need to ensure that boats are waterproof. They apply filters, sealants, and fibreglass and when the construction work is complete, all parts are varnished or painted. They also repair and replace worn-out wooden parts such as steps and masts. Boat builders and shipwrights can work outdoors on boats that are afloat or in dry- dock, or indoors in a workshop.

Boat builders and shipwrights may work on different types of boats and ships or they may specialize in one type such as fishing boats, motorboats or battleships. They may also specialize in the type of material used such as wood, metal or fibreglass.

Some fulfilling and satisfying aspects of this career
- working with one's hands
- seeing the results of one's work
- being active
- working both indoors and outdoors
- being creative
- solving problems
- making something that lasts

Some demanding and challenging aspects of this career
- the amount of standing, stooping and lifting
- the possibility of being injured at work
- hot, cold or noisy work environments
- stressful due to deadlines
- not being able to find enough work

Purpose Orientation
- like to work with his hands;

- be interested in working with wood;
- have neat, orderly work habits;
- work with great precision;
- take pride in good craftsmanship
- be able to visualize three-dimensionally
- be able to read plans and specifications and calculate material, tool and process requirements
- be creative and artistic
- practical and accurate
- disciplined and able to work well under pressure
- good communication skills
- able to establish good working relationships with other people, such as clients and boat builders
- knowledge of maths, physics and chemistry

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course
Ordinary Level Certificate for boat builders; some employers prefer higher qualifications

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Physical Sciences

Training
Many people who become marine architects undertake a degree in engineering, followed by further training, either overseas or by correspondence from an overseas university or training institute.

Marine architects gain many skills on the job. They may also study while working to increase their skills

Boat builder:
Apprenticeship training.

Employer
- Navy
- Private shipbuilding firms
- Self-employment, with enough capital to start own shipbuilding operation

Career 6: Boilermakers

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 head-gear, bridges and oil-drilling platforms.

Prior to the construction of a new boiler, all the materials must first be prepared before the actual work of assembly and construction can begin. Drawings are made in separate sections and many calculations are made in this 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 have to 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. Work settings may be hot, noisy, poorly ventilated or damp. Often they must work in cramped quarters inside boilers. The work can be dangerous since they may have to work at considerable heights and/or around heavy, dangerous equipment.

Some fulfilling and satisfying aspects of this career
- the challenge of constructing and maintaining equipment
- working with others
- good wages and fringe benefits
- working with one's hands
- a variety of tasks and locations

Some demanding and challenging aspects of this career
- 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 at night sometimes
- the possibility of injury at work

Purpose Orientation
A boilermaker should:
- have some insight into electrical engineering
- have mechanical aptitude;
- be practical and accurate;
- be responsible, alert and careful;
- enjoy working with his hands;
- work well with others;
- be able to concentrate under noisy working conditions;
- have physical strength, stamina and flexibility;
- have good eye-hand co-ordination;
- have manual dexterity;
- have good eyesight.

School Subjects
Ordinary Level Certificate.
Some employers demand higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Physical Sciences

Training
Apprenticeship training

Employer
- Engineering factories
- Construction companies
- Iron and steel plants
- Petroleum refineries
- Railways
- Shipyards
- Government departments
- Electrical and atomic power plants

- mines
- self-employment, with the necessary experience and capital to start own business

Career 7: Cabinetmaker

Cabinetmakers build and repair wooden cabinets and high grade furniture using a variety of woodworking machines and hand tools. They receive wooden components from wood machinists and assemble the pieces, adding doors, drawers and locks.

The work of cabinetmakers involves handwork and a traditional woodwork approach, although they may also work with electric and pneumatic tools. They work with wood as well as modern materials such as melamine. They usually work in workshops or on sites where cabinets have to be installed.

Cabinetmakers' work is varied. They study plans and blueprints of designs and then plan the order of operations. They mark outlines of parts on paper or timber according to specifications and match materials for colour, grain or texture. They set up and operate machines such as power saws, joiners and mortises to cut and shape wood. They trim some parts with the use of hand tools to ensure a tight fit. Holes are drilled for screws or dowels.

The various parts are then fitted, glued and clamped together to form complete units. The articles are sanded down and in some cases stained, then finished off by installing hinges, catches and drawer knobs.

Some cabinetmakers may specialize in working only with a particular type of wood, e.g. kiaat.

Some fulfilling and satisfying aspects of this career
- good employment opportunities
- good pay
- a variety of work projects
- working with one's hands
- satisfaction derived from seeing the finished products

Some demanding and challenging aspects of this career
- a lot of standing, stooping and lifting
- dust which may irritate the respiratory system
- noise from machines
- the possibility of injury on the job

Purpose Orientation
A cabinetmaker should:
- be a patient and accurate worker

- have creativity and imagination
- have a sense of proportion and spatial perception
- get along well with others
- be able to work well with or without supervision
- take personal pride in work done
- have good health
- have physical strength and stamina
- have good vision and spatial perception
- have good eye-hand coordination
- have manual and finger dexterity

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None
Recommended Subject: Mathematics

Training
Apprenticeship training

Certificate in Furniture Production: 3 month course for employees already in the industry

Employer
- Furniture manufacturers
- Cabinet-makers
- Kitchen manufacturers
- Building contractors
- Woodwork workshops
- Self-employment

There is a high demand for this craft.

Career 8: Ceramic Artist

Ceramic technology is concerned with the research, development, and manufacture of non-metallic inorganic materials. A ceramic artist designs and produces ceramic objects such as tableware, vases, decorative pots, wall decorations and sculptures.

This is a very challenging and vast field of work in which an enormous range of textures and colours can be used. Kilns and firing techniques range from the ancient bush-firing method and Japanese type raku firing to gas, oil and sophisticated electrical kilns. The techniques used include wheel-throwing, coiling, press-moulding and slip casting. Modern ceramic artists supply a demand for individual functional and decorative pieces of pottery and other objects. Wall-decorations and art works are also in demand.

The field spans a range of creative levels from working in a ceramics factory within a fairly rigid framework to producing attractive pottery for the tourist and cottage industries and the highly creative environment of an individual ceramic artist creating original ceramic sculptures.

Many ceramists design their sculptures on paper with a series of sketches. Then the clay is prepared and the sculpture or item is created. A choice of materials is made, such as low-firing earthenware clay, high-firing stoneware or porcelain.

Wet, plastic clay is formed by using various techniques such as rolling it out into flat slabs, cutting out the required shapes and joining them together after they have set slightly. Articles can be decorated or coloured in a variety of ways like textured, carved, coloured with special glazing and ceramic materials such as oxides and slips, painted or sprayed. After the glaze has been applied, it is fired to fuse the glaze into a hard, glossy surface.

A career in ceramics will appeal to those who enjoy creating artistic solutions to practical problems. This career involves working with one's hands and handling various materials. Ceramic artists need to master several skills including: clay selection and preparation; forming the clay by hand-sculpting, wheel-throwing, coiling, press-moulding and slip casting; decorating articles by texturing, carving or painting; firing by any one of numerous methods, ranging from extremely simple to highly sophisticated.

Monetary rewards depend on the ceramic artist's skill and ability to effectively market their work. This is becoming much easier with the trend moving towards entrepreneurship and open markets are providing outlets for goods of this nature.

Some fulfilling and satisfying aspects of this career

- making beautiful objects
- working artistically with your hands
- learning and finding new techniques and glazing methods
- being your own boss

Some demanding and challenging aspects of this career
- hard work
- struggling financially, especially if working on your own

Purpose Orientation
A ceramist should:
- be artistic, creative and imaginative
- be patient, persevering, self-disciplined and self-motivated
- be creative and have initiative
- be manually dexterous
- be perceptive and ability to transform perceptions into a work of art
- have good sense of form, design and colour
- be dedicated to this artistic form of craft

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Visual Arts, Physical Sciences

Training
No formal training is required to work as a ceramist.

Certificate and short courses: Several courses offered at colleges and specialized art colleges.

Employer
- Large manufacturers (mass tableware and home-furnishing)
- Smaller manufacturers and large studios (supply tourist outlets and the cottage industry)
- Small to medium-sized studios (supply specialised items for interior decorators and private clients)
- Advertising agencies
- Government departments and museums (ceramics restorer, adviser in respect of museum

displays or adviser regarding the cleaning and caring for antique ceramics)
- Home furnishing stores and interior decorating companies (ceramics buyer)
- Manufacturers of automobile parts and home appliances (clay modelling)
- Teaching (in an institution or on a private basis)
- Self-employment, with own ceramics studio

Career 9: Clothing Designers

Clothing designers apply their knowledge of style, line, colour, proportion and fabrics to the task of designing clothing. The industry covers a broad spectrum of work and a designer may slot in at various levels of creativity.

Clothing design is a very competitive field and only a few designers become trend-setting fashion leaders. Factories manufacturing garments for the mass market employ most of the clothing designers.

Clothing designers create clothes that can be produced within a certain price range and in keeping with current styles and trends. They get ideas for styles by scanning trade publications, visiting stores and travelling and observing lifestyles. They develop and record their ideas by making sketches, draping dummies and making patterns.

They select colours, fabric and trimmings for their designs and then prepare samples or model garments, which are checked carefully for appearance, fit and quality of work. If accepted, the samples are included in their lines and presented to sales personnel or private clients.

Fashion styling falls into this field and entails the selection and adaptation of high-fashion garments for lower-budget production for the mass market. A designer may also specialize in certain types of clothing, such as footwear, hats, or sportswear.

Some fulfilling and satisfying aspects of this career
- challenging work
- variety of work
- being able to express yourself creatively through your work
- seeing people wearing your designs
- keeping up with and influencing styles and fashions

Some demanding and challenging aspects of this career
- working to meet deadlines
- having to redo a design to meet cost limitations or to satisfy the wishes of others
- having to continuously compete

Purpose Orientation
A clothing designer should:
- have creativity, imagination and an interest in fashion;
- have a good sense of colour, line and proportion;

- have an eye for detail;
- have drawing ability;
- be able to solve problems;
- be able to work independently;
- have self-discipline;
- be able to meet deadlines;
- have business sense and sales ability (freelance work or own business).

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Visual Arts, Economics, Consumer Studies

Training
Diploma: 3-year National Diploma in Fashion Design or Clothing Production

Employer
- established couturiers, as fashion designer, pattern designer or fashion stylist
- magazines, as a fashion illustrator
- clothing manufacturers
- textile companies
- performing arts councils
- self-employment, as a freelance fashion designer or own couturier business

Career 10: Clothing Manager

Clothing managers plan, organize, coordinate and control the production of clothing in a factory.

Clothing managers are responsible for production planning and control. They ensure that high standards of quality are met and that clothes are supplied on time and within cost constraints. They liaise with other functional managers on issues such as: design, marketing, finance and human resources. They check that workers follow instructions and work according to the production plan and to deadlines.

They need to have a thorough knowledge of the processes, techniques and skills required and are always looking for ways to improve existing systems and production processes.

Clothing managers need to ensure that materials and accessories are ordered and received on time. They may also be involved in work-study, production, cutting, quality control, administration, management, marketing and distribution.

Some fulfilling and satisfying aspects of this career
- working with people in a creative environment
- challenge of meeting deadlines successfully
- the large variety of activities

Some demanding and challenging aspects of this career
- stress, working to deadlines
- responsibility of keeping costs down and productivity up
- possible strikes in the industry

Purpose Orientation
A clothing manager should:
- be creative, imaginative and have artistic talent;
- have technical skills;
- be persistent, self-confident and persuasive;
- get along well with others;
- be patient, tactful and observant;
- have good judgement and business sense.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Visual Arts, Economics, Consumer Studies

Training
BTech and Diploma in Clothing Management

Employer
- Clothing factories
- Fashion houses and exclusive shops
- Clothing chain stores
- Self-employment, with the necessary experience and capital, start own clothing manufacturing company

Career 11: Clothing Patternmakers

The main function of clothing patternmakers is to translate the fashion designers' creations into patterns. These patterns are the starting point of a chain of activities leading to the manufacture of clothing.

First, an initial working sketch is made from the design. After the pattern has been sketched and the specifications outlined, a sample garment is made up. A master pattern is then prepared and the pattern is graded into different sizes.

Patternmakers also work with boutiques and clothing factories.

Some fulfilling and satisfying aspects of this career
- working with your hands
- working with creative people
- seeing the results of your work

Some demanding and challenging aspects of this career
- frustration in making patterns for complicated designs
- dealing with over-demanding and critical designers

Purpose Orientation

A pattern-maker should:
- have an interest in fashion;
- have an eye for design, line, colour and detail;
- work accurately;
- have numerical ability;
- be able to work quickly and meticulously under pressure.

School Subjects
Ordinary Level Certificate.
Advanced Level Certificate for the university courses.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Consumer Studies

Training
Diploma in Fashion Design or Clothing Production

Employer

- Clothing factories
- Manufacturing boutiques

Career 12: Cobbler

Cobblers are people who make and mend shoes and boots by replacing worn soles and heels by either sewing or gluing on the new pieces. The leather for new shoes is moulded over a last, an anvil-like structure shaped like a foot. They also stitch buckles to shoes and boots using special twine and an awl, which is a large thick needle, or a powerful sewing machine.

Sometimes cobblers are required to sew sequins or other paraphernalia onto shoes, takkies or boots. These days glue often replaces stitching, as the results are the same, if not as long lasting. Suede, leather, leather-like material, canvas and cardboard are some of the materials used by cobblers to 'cobble' footwear.

Some fulfilling and satisfying aspects of this career
- seeing a piece of footwear remodelled and improved
- liaising with customers
- meeting new people daily

Some demanding and challenging aspects of this career
- working long hours
- possible eyestrain

Purpose Orientation
- enjoy working with your hands
- accurate and methodical
- able to communicate with all kinds of people
- self-motivated
- an eye for detail
- friendly and helpful
- manual dexterity
- good eyesight

School Subjects
Ordinary Level Certificate

Compulsory Subjects: None
Recommended Subjects: None

Training
In-service training is offered by experienced operators / instructors. The general factory worker

does not undergo in-service training, but the learner operators are subjected to in-service training.

Employer
- shoe repairing shops
- dry-cleaners
- self-employment

Career 13: Coppersmiths

Coppersmiths work mainly with non-ferrous metals such as copper and brass, manufacturing cylinders, pipes, cisterns and art objects.

Blueprints of the intended structure are studied and the copper plates marked off accordingly. Copper plates are bent to prescribed angles, holes are drilled and edges smoothed. The copper plates are cut either mechanically or by means of a gas cutter. Copper plates are then straightened, bent, rolled or dished to the required forms. The shaping is done with heavy machines working on the cold copper plates. Hot processing is sometimes required when difficult angles have to be shaped. Holes for rivets and stays are drilled into marked-off positions. Overlapping sides are compressed together.

Some fulfilling and satisfying aspects of this career
- working with one's hands
- the satisfaction of seeing results of one's work
- the opportunity to become self-employed
- being creative

Some demanding and challenging aspects of this career
- the possibility of injury whilst on the job
- unpleasant working conditions

Purpose Orientation
A coppersmith should:
- have technical and practical aptitude;
- have mechanical insight;
- be creative;
- have artistic ability;
- pay attention to detail;
- be able to concentrate well;
- have knowledge of and interest in various metals;
- enjoy working with his hands;
- have good health and average physical strength;
- have hand and finger dexterity;
- have good eye-hand co-ordination.

School Subjects
Ordinary Level Certificate.

Some employers prefer higher qualifications.

Compulsory Subjects: None
Recommended Subjects: None

Training
Apprenticeship training

Employer
- Government departments
- Metal manufacturers
- Mining companies
- Large engineering concerns
- Large chemical companies

The coppersmith with the necessary experience can practise his trade on a private basis or start his own business.

Career 14: Craftsperson

Craftspeople or craft practitioners design, make and repair objects that have both functional and artistic qualities, working in wood, metal, glass, leather, ceramics, textiles and other materials.

Craftspeople design the style and shape of objects. They use and manipulate materials to make objects according to the design. They finish off objects to enhance their artistic and/or practical qualities. Some craftspeople are asked to repair damaged or defective craft objects.

Craftspeople may specialize in one or more of the following:

Fibre Textile Workers, who work with weaving, felting, embroidery, stitching, quilting, dyeing, printing and garment design to create articles of clothing, finishings and decorative items. They may also do lace making, tapestry, collage, basketry, crochet, macramé, rug making, knotting, bookbinding and fabric painting.

Glass Workers work with hot glass (glassblowing and casting), warm glass (fusing and slumping) or cold glass (stained glass and lead lighting) to produce a variety of glassware and decorative items.

Leather Workers design, make and decorate shoes, bags, soft furnishings and gloves.

Metal and Jewellery Workers work with copper, brass, nickel, pewter, gold, silver and other metals to create jewellery and utensils such as enamelware and cutlery. They may choose to weld, paginate, cast, beat, construct and manipulate materials to suit the design.

Potters / Ceramicists mould clay into functional items such as mugs, bowls and tableware or conceptual (idea-based) works by wheel throwing, moulding or hand building. They then mix glazing materials to decorate, using various techniques, and apply the glaze. They put the finished or decorated pieces into kilns for firing and may decorate the pottery for artistic effect.

Wood Workers may choose to carve, lathe turn, laminate, inlay, construct and sculpt wood to produce items such as sculptures, decorative wall panels, furniture, picture frames, jewellery boxes and eating utensils.

Most craftspeople are involved in small business operations and often rely on exhibition sales and commissions to sell their work. Exhibitions and major commissions provide opportunities to become well known and therefore increase business prospects. Work is sold wholesale to shops, galleries and department stores or directly from the studio. Only a few craftspeople are employed

full-time in their craft. Often other career opportunities develop in craft education, administration, curating, museum and gallery conservation or community artwork.

Some fulfilling and satisfying aspects of this career
- expressing your ideas in visual form
- possibly becoming famous, especially for establishing a particular style or technique
- possible high earnings and own business
- working your own hours

Some demanding and challenging aspects of this career
- some projects can take a long time to complete
- sometimes back-breaking work in awkward positions
- difficulty making ends meet during slumps and long projects
- long hours, especially when first setting up own business and if working to a deadline on a project

Purpose Orientation
- above-average artistic design abilities
- promotional skills
- able to work alone and in isolation for long periods
- able to visualize three-dimensionally
- creative, imaginative and not afraid to try new ideas
- business skills, especially if self-employed

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Visual Arts

Training
There are no formal educational requirements to become a craftsperson. However, entry to this occupation may be improved if you have qualifications.

Degree: BA (Fine Arts)

Diploma in Fine Arts

Some craftspeople are self-taught and often find it beneficial to work under the guidance of an established craftsperson.

Employer

- any organisation or individual who might commission you to create a specific work or piece of art
- shops who want on-going orders met
- educational institutions, as a teacher, lecturer or instructor
- craft administration, eg. as curator with museums and art galleries
- self-employment, with own studio and maybe own outlet

Job opportunities very much depend upon the quality and reputation of an individual's work; the level of tourist activity and the amount of money spent by tourists; fashion trends and the popularity of the craft pieces and the craftsperson; and local and export demand for hand-made craft pieces from the country concerned.

Career 15: Crane Operator

Crane operators control a crane in order to hoist or transfer heavy objects from one level to another. They manoeuvre the crane in such a way that the load comes to a standstill in the required place.

In cases where the crane is mobile on tracks, the crane operator regulates the backward and forward movement. The operator needs to make sure that the cable does not jerk. The crane operator of an outdoor crane may be assisted by ground personnel by means of telephone or by hand signals.

Working conditions vary from place to place. The overhead crane operator is often exposed to the heat, smoke and gases of factories. Weather conditions have an influence on the outside worker. Modern cranes, however, have comfortable cabins. Overtime work is often required.

Some fulfilling and satisfying aspects of this career
- working with one's hands
- working as part of a team
- working at different sites

Some demanding and challenging aspects of this career
- may have to work overtime
- working conditions may be uncomfortable

Purpose Orientation
A crane operator should:
- be responsible and reliable;
- be alert;
- be unaffected by the height at which he works;
- be patient and have perseverance;
- have good eyesight;
- have good eye-hand coordination as well as good coordination between right and left;
- have manual dexterity;
- be able to judge distances and heights accurately.

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None

Recommended Subjects: None

Training
In-service training: The law requires all crane operators to be formally trained. Most of the larger organizations offer a bridging course after appointment. During this course aspirant crane operators receive a broad knowledge of the general activities in which they might be involved. This in-service training is either done by a training officer, a foreman or an experienced senior operator. During this initial stage crane operators will be under the supervision of a co-operator.

In certain instances crane operator training can only be performed by an organization that has the approval of the chief inspector. When this is the case, the operators must pass a theory and practical test before they receive a valid certificate of training (licence) which entitles them to operate the crane on their own. They are required to be re-tested every two years to ensure they remain competent as crane operators.

Employer
- Building industry
- Manufacturing industry
- Airports
- Construction sites
- Harbours

Career 16: Desktop Publisher

Desktop publishers, or electronic originators, produce professionally designed and presented documents, according to specified design and presentation requirements, using desktop publishing software.

Due to technological advances, especially in the area of computers, almost all the preparatory tasks previously done by hand and on printing machines are now done on high-powered computer systems. The desktop publisher performs a range of functions, both creative and technical, in meeting the needs of a client.

In the concept phase, they may talk to clients to obtain a clear understanding of their requirements. Clients' requirements may include preparing booklets, brochures, advertisements, in-house magazines, newsletters, training and technical manuals, stationery, and books ready for printing or publishing.

They may then prepare quotations for contract work and negotiate with the client for the approval thereof. A desktop publisher may also prepare a concept document that includes the preparation of sketches and design concepts.

Once the client has approved the concept the desktop publisher can then get on with the work of designing and arranging layouts to meet clients' requirements. In some cases the documents and drawings are provided by the client. In such cases this means the manipulation of available drawings, photographs, texts and artwork to produce a final product.

Detailed work may include type-setting, the preparation of lines or half-tone pictures in single or multi-colour separations (colour printing), making positives and negatives and preparing the printing plates for the presses.

Some fulfilling and satisfying aspects of this career
- being creative
- variety of work
- mostly office hours
- relatively good earning potential
- possibility of setting up own business

Some demanding and challenging aspects of this career
- stress due to working to deadlines
- having to do what clients want, rather than following your own creative ideas

- finding new creative routes; and sometimes having to work overtime

Purpose Orientation
A desktop publisher should:
- be able to adapt to the changes in technology;
- have some artistic flair;
- have good colour perception;
- have an analytical mind;
- be able to concentrate;
- able to work quickly and accurately even under pressure;
- be interested in photography.

School Subjects
Ordinary Level Certificate for a diploma course

Compulsory Subjects: None
Recommended Subjects: Visual Arts, English, Languages, Information Technology

Training
Diploma in Graphic Design

Alternatively, to qualify as a photo-lithographer / electronic originator, registration with an employer providing suitable training is required. Training consists of theoretical and practical work.

Employer
- Commercial printing plants
- Book and magazine publishers
- Newspaper plants
- Stationery and envelope manufacturers
- Government departments
- Government Printing Works
- Manufacturers and other firms that do their own printing

Career 17: Diamond Cutter

Diamond cutters and other workers in the diamond industry cut and polish rough diamonds in such a way as to reflect maximum light.

Diamond cutting involves a number of stages and each stage requires a specialized tradesman to do the job:

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Diamond cutting involves a number of stages and each stage requires a specialized tradesman to do the job:

Sorter: Diamonds are first sorted by diamond sorters into various shapes, sizes, colours and qualities.

Marker / Designer: Diamond markers' skills are similar to those of architects. Markers and designers decide what the final diamonds will look like when completed.

Polisher: There are an infinite number of ways in which a diamond may be polished and the decision as to how the diamond should be marked will be based on an attempt to maximize the value of the finished product.

Diamond Sawyer: Sawyers saw the diamond using copper discs spread with diamond powder and oil. Sawyers set stones in holders containing plaster. Stones are then placed in sawing machines and the lines on the diamonds are carefully aligned with saw-blades.

Diamond Cutter: Cutters create perfectly round diamonds with the optimum diameter. Industrial diamonds are used to cut diamonds. Diamond cutters receive diamonds from sawyers to start the second phase of finishing off the rough diamond.

Cross Worker: Cross workers lay the foundation of the diamond and follow instructions to obtain the optimum value for finished products. The work is done on a polishing disc covered with diamond powder. The diamond is held in a clamp and 18 facets are polished one by one.

Brillianteer: The last process of refining the rough diamond is to polish it. The sharp edges of the top and eight angles are cut away so that in the end the brilliantly shaped diamond will have 58 facets which reflect light to give it its characteristic brilliance.

Nearly all diamond-cutting factories are located in the Witwatersrand area, resulting in these artisans living in or moving to that area.

Some fulfilling and satisfying aspects of this career
- working with your hands
- doing precise and detailed work
- pleasant work setting and working conditions
- working with objects of beauty and value

Some demanding and challenging aspects of this career
- the possibility of eyestrain resulting from a lot of detailed work
- the total concentration required when working with tiny objects
- no contact with the public
- sitting for long periods of time, or doing a lot of standing work once one is more experienced

Purpose Orientation
A diamond industry worker should:
- be patient and careful:
- be accurate and precise;
- concentrate on detail for long periods;
- be reliable and honest;
- have good spatial perception;
- enjoy using their hands;
- have excellent eyesight;
- have hand and finger dexterity;
- have good eye-hand coordination;
- have mechanical skills.

School Subjects
Ordinary Level Certificate (Polisher and Cutter).

Compulsory Subjects: None
Recommended Subjects: None

Training
Diamond Mining countries have Diamond Education Colleges that offer courses in this field.

Employer
- diamond cutting factories

- jewellers

Career 18: Die Sinker and Engraver

Die sinkers and engravers are artisans qualified in the designing, modelling and striking of medals and coins. They also oversee the machines from which these coins and medals are struck.

When a new coin or medal is made, a sketch-plan is made of that which will be portrayed. This is often the task of the die sinker and engraver. These designs can be front views, skew or profile views of well- known people, portraits of buildings, of symbolical designs. After the institution that proposes the medal or coin has approved the sketch design, the design is modelled. This task requires exact craftsmanship and is usually done by the die sinker and engraver. The initials of the modeller are struck onto the medal or coin, together with the design. The model is then moulded into a plaster negative and an acrylic positive.

Hereafter the die sinker and engraver supervises the reducing process, where the acrylic positive is used to cut a steel the that will be the actual size of the final product. A negative is again printed from this positive die to which the necessary wording is added with letter and number punches.

The engraving process includes machine and hand engraving of monograms, different letterforms, and decorative work on precious metals. Engraving is done on moulds, plastic and metal advertising signs, metal attachments, clasps, buckles, buttons, badges, medallions and memorial coins. They also emboss rollers for tinfoil or plastic date stamps and plaques.

Some fulfilling and satisfying aspects of this career
- working with your hands
- variety of work
- opportunity to specialize
- being creative

Some demanding and challenging aspects of this career
- sitting for long periods
- possibility of accidents or injuries on the job
- possible eyestrain from continuous detailed work

Purpose Orientation
The die-sinker and engraver should:
- enjoy using his hands;
- be creative;
- have artistic ability;

- be patient and precise;
- be neat and accurate in his work;
- have good eyesight;
- have manual dexterity;
- be able to do detailed work.

School Subjects
Ordinary Level Certificate.
Some employers demand higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Mechanical Technology, Visual Arts, Mathematics, Physical Sciences

Training
Apprenticeship Training

Employer
- National Mint companies (main employer)
- African Defence Force
- Police Force
- Correctional / Prison Services
- Jewellery and metal industries
- Printing industry
- Plastics industry
- Medal manufacturers
- Self-employment, with enough experience and capital, can start own business, for example manufacturing memorial coins and medals for private institutions, municipalities, schools, mines and private clubs

Career 19: Explosives Technologist

Explosives technologists develop, document, manufacture, examine, store, transport, inspect and test explosives, both for commercial and military purposes. In the manufacturing industry, they are responsible for the planning of production plants, processes and analytical methods for the manufacture of explosives for the mining and engineering industries, as well as their evaluation and application. They prepare scale models of the envisaged plant, plan down to the finest details and specify the processes to be followed.

In the laboratory, routine analytical processes and development take place. Raw materials are first analyzed, then technologists ensure production goes according to plan and that final products measure up to expectations. Research is carried out to develop new techniques, processes and products. If these are accepted, specifications are drawn up for their implementation.

Inspectors of occupational safety, working for the Department of Labour, inspect various organizations that store explosives to ensure the safety of people working there. In the Police Force, explosives experts have to destroy explosives that have been abandoned.

At the Department of Mineral and Energy Affairs, explosives experts are not only involved in blasting, but also in the inspection of health and safety regulations at mines. For example, blasting is only done at specific times, to ensure that workers are not exposed to harmful fumes.

In the public sector, explosives technologists or demolition experts are responsible for the planning and execution of blasting operations in the mining and engineering industries. This involves blasting operations for making excavations, ditches and swimming pools, and for the demolition of buildings and for special effects. They can also be employed in channels where gravel and granite are mined.

Explosives technologists often work in teams with scientists, technicians and tradesmen. In this process they are sometimes involved in research and development and responsible for the management of very sophisticated processes and systems. The explosives industry is, in contrast to what is sometimes believed, one of the safest occupations in the country. However, working with explosives is still extremely dangerous and explosives technologists are always provided with safety equipment and the relevant training.

Management skills, computer literacy, a healthy work ethic and entrepreneurship, are actively promoted during training.

Some fulfilling and satisfying aspects of this career
- being able to defuse an explosive device in time and save lives
- being able to produce new explosive devices for defence purposes
- saving much time, effort and money by using demolition techniques

Some demanding and challenging aspects of this career
- high degree of concentration for long periods of time when handling explosive devices
- stressful and dangerous work
- devastation if a device is not defused in time and people get hurt or maimed

Purpose Orientation
An explosives technologist should:
- be scientifically and practically inclined
- be responsible and conscientious
- be creative and innovative
- be meticulously accurate and have an eye for detail
- have an aptitude for mathematics
- be able to handle stress and pressure
- be mature and emotionally stable
- have high integrity
- have good hand-eye coordination and be observant

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course
Ordinary Level Certificate for a certificate course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Engineering and Technology

Training
Degree: A BTech in Explosives Management

Diploma in Explosives Management

Post-graduate studies: a diploma can be followed by a fourth year of study to obtain a degree, BTech An MTech and a DTech can follow a BTech. consisting of applied research at an advanced level and is normally focused on specific problems of the company where the explosives expert is employed.

Employer

- commercial undertakings which use explosives
- mining companies
- Defence Forces
- Police Force
- Navy where applicable
- Department / Ministries of Mines and Energy
- engineering companies
- self-employment, ample opportunity to start own business in the public sector, given enough experience, initiative and capital

Career 20: Fibreglass Worker/Laminator

Fibreglass workers or laminators manufacture articles from fibreglass mixed with resin. They make prefabricated building components, bathroom units, tanks, pipes, canopies and bodies for boats, vehicles and swimming pools. Most of these products are made of fibreglass because it does not rust or corrode.

Fibreglass workers also manufacture and fit wooden and metal beams for reinforcing cabs and cabins in pleasure-craft and boats.

Fibreglass workers make forms, models or moulds for fibreglass items, for example for containers such as storage tanks, bath tubs and basins, containers for acids and corrosive chemicals and measuring instruments.

When a boat is built, a mould must be manufactured from wood. On this mould, a fibreglass mould is fashioned with which the genuine fibreglass boats are manufactured. This mould needs to be smoothly finished to ensure that the final product looks good.

The form or mould is treated with a chemical releasing agent to prevent the fibreglass material from sticking. Successive thin layers of polyester resin are applied with a brush or sprayed on with a chopper-gun unit until the required thickness is obtained. Then a thick layer of resin is applied and immediately covered with a layer of fibreglass which is rolled on with a roller or brush to ensure that the resin and fibreglass mix well together.

Further layers of fibreglass bonded together with a polyester resin, are applied, until the required thickness is obtained. According to the design, the item can be smooth or coloured on the outside. This is done by applying a special resin onto the mould with a very thin cover-layer of fibreglass. The layer of resin may then be dyed to the required colour. The cover-layer prevents the fibreglass pattern from showing.

On the inside of the item, a last, thick layer is applied to ensure that the fibreglass is covered and that the item is, therefore, waterproof. The product is left to dry and cure, after which the product is released from the mould. The item is then sandpapered, washed and polished where necessary.

Fibreglass workers need to know how to mix resin with hardening agents, catalysts and accelerating agents to obtain the desired mixture and texture of fibreglass. Incorrect mixing could be hazardous.

They also need to be adept at working with all sorts of woodwork tools. Working conditions may

vary according to the organization or factory where the fibreglass worker is employed. Work is carried out either indoors or outdoors. The work place is usually well lit with adequate ventilation, although the conditions may be very dusty and dirty.

Fibreglass workers must take special care to protect themselves from the fibreglass and resin, which are difficult to remove from the skin and clothing. They must wear protective clothing like gloves, safety boots, aprons and facemasks at all times, as the material used is heated to very high temperatures. Facemasks or gasmasks also protect the lungs from the fibreglass particles and chemical gases, which can be damaging.

Some fulfilling and satisfying aspects of this career
- opportunities to be artistic to some extent and create things
- working with your hands
- the possibility of working for yourself

Some demanding and challenging aspects of this career
- extra care needed with chemicals that are hazardous to the health
- the fine particles of fibreglass than can be inhaled

Purpose Orientation
A fibreglass worker should have/be:
-enjoy working with different materials and with your hands
- manual dexterity
- some artistic ability
- mathematical skills and accuracy
- able to read plans and make calculations
- certain amount of technical ability
- good eye-hand coordination and good form and spatial perception
- eye for detail
- good health

School Subjects
No specific requirements.
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Physical Sciences

Training
Employers provide training and it takes approximately 3 to 6 months to master the basic facets of the work.

Employer
- private manufacturing factories where boats, prefabricated building components, swimming pools and other products are manufactured
- industrial concerns
- roofing and plastic manufacturers
- self-employment

Career 21: Fitter and Turner

Fitters and turners 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.

Fitters and turners first select and mark off the material required according to exact measurements on blueprints, drawings or a model. They then shape the rough piece of metal into its final form with power-operated tools such as lathes, milling, drilling and planing machines. Finally they fit the parts required to complete the machine or article and inspect and test the final assembly for true fit.

Some fulfilling and satisfying aspects of this career
- working with your hands
- the opportunity to specialize
- good employment opportunities and earning potential
- challenge of constructing and maintaining equipment
- seeing the results of your work

Some demanding and challenging aspects of this career
- physical demands, such as standing, bending and crouching can be tiring
- working overtime on public holidays as well as weekend and nightshift work
- working in noisy, dirty and sometimes crowded conditions

Purpose Orientation
A fitter and turner should:
- 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 the turning is in progress;
- able to concentrate under noisy working conditions;
- be responsible;
- be able to read three-dimensional drawings.

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Mechanical Technology, Mathematic, Engineering and Graphic Design

Training
The duration of the learnership is normally 4 years in the metal industry.

The training of fitters and turners can be divided into three aspects, namely the practical training at an accredited training centre, in-service training under the supervision of qualified tradespersons and theoretical training.

Employer
- Fitting and turning contractors engaged in manufacturing, construction or maintenance and repair
- Large engineering works
- Large industrial plants
- Factories
- Iron and steel plants
- Shipyards
- Government departments
- Mines
- Garages

Career 22: Footwear Manufacturing Technician

Footwear manufacturing technicians work mainly in shoe factories or related organization. They may specialize in design, production management, industrial engineering, quality control, or in general and executive management.

Footwear technicians' activities will depend on their choice of specialization. In general, they learn all the aspects of footwear production. This will involve them in a factory production situation using a variety of complex raw materials, either natural, or synthetic, or both.

They may also work with technologically advanced machinery, electronics and computer systems used in the manufacturing process. They may stay in this work environment, or choose to start their own factory, specializing, for example, in sports footwear.

Footwear technicians work with leather and imitation leather, chemicals, chromium salts and vegetable paints, designs and drawings, knives and guillotines, hand and machine tools, adhesives and various kinds of thread, and machines for spraying and polishing.

Some fulfilling and satisfying aspects of this career
- working with your hands
- variety of work tasks
- the opportunity to specialize
- the satisfaction of applying good workmanship to finish an article
- the chance to become self-employed

Some demanding and challenging aspects of this career
- health hazards resulting from the chemicals used
- having to stand for long periods

Purpose Orientation
- aptitude for practical work and machines
- some interest in art and drawing for design work
- prepared to work in a production and/or business environment.
- enjoy working with leather and other materials
- enjoy working with your hands and tools

School Subjects
No minimum educational requirements, but an Ordinary Level Certificate would be an advantage

Compulsory Subjects: None
Recommended Subjects: Mathematics, Physical Sciences, Engineering and Technology

Training
The industry provides formal and accredited training different Universities.

Through self-study, distance learning and exemption courses, a Diploma in Footwear Technology and Management can be obtained. This diplomas is recognised as the top qualification in this industry.

Employer
- big and small footwear factories
- suppliers of machinery or materials to make footwear
- self-employment - since establishment costs for a small factory are reasonable, can start own business soon after qualifying and with enough capital

Career 23: Frame Maker

Frame makers are involved in the building and repairing of wooden cabinets, beds, couches, chairs and other high grade furniture. They are responsible for the designing, building and repairing of sturdy frames to be used in these various products. Great emphasis is placed on the engineering of such frames.

The work of frame makers involves machine and handwork. This includes working with wood as well as modern materials such as melamine. The frame makers work in a workshop or on the site where cabinets have to be installed.

Some fulfilling and satisfying aspects of this career
- good employment opportunities
- good pay
- a variety of work projects
- working with one's hands
- satisfaction derived from seeing the finished products

Some demanding and challenging aspects of this career
- a lot of standing, stooping and lifting
- dust which may irritate the respiratory system
- noise from machines
- the possibility of injury on the job

Purpose Orientation
A frame-maker should have/be:
- undergo a battery of selection tests
- very accurate worker
- good vision and good eye-hand coordination
- spatial perception and a sense of proportion
- manual and finger dexterity
- able to work well with or without supervision
- take pride in your work
- good health, physical strength and stamina

School Subjects
Ordinary Level Certificate.
Advanced Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Mechanical Technology, Mathematics

Training
A course in Furniture Making

Employer
- Furniture manufacturers
- Cabinet-makers
- Kitchen manufacturers
- Building contractors
- Self-employment, with enough experience, initiative and capital, can open own woodworking factory

Career 24: Furnisher Finisher

Furniture finishers sand furniture with sandpaper to obtain a smooth surface. Cracks in the wood are plugged with either agglutinant or putty. The article is then stained and varnished (for example, pine) or varnished only (for example, imbuia).

To stain the article, it is dipped into a solution which provides an even layer of colour over the entire surface. When dry, the bottom coat of sealer is sprayed on rapidly and accurately with a spray gun, care being taken to ensure that it is evenly sprayed and does not form drops.

The article is dried rapidly in a room equipped with fans which blow warm air directly onto it. The article is sandpapered again by hand and the lacquer or varnish is sprayed on. Usually three or more coats are applied and between coats it is sanded lightly.

Furniture finishers may specialize in sanding, staining or varnishing furniture.

Furniture finishers work with: different grades of sandpaper; stains and varnishes in various colours; tools such as spray guns and drying fans; agglutinant, putty and sealer.

Furniture finishers work indoors in workshops that are usually provided with ample light and ventilation. The work involves standing most of the day. The use of stains and varnishes necessitates the wearing of protective clothing. Furniture finishers may also wear masks to prevent the inhalation of wood dust.

Some fulfilling and satisfying aspects of this career
- working with one's hands
- working as part of a team
- variety of work tasks
- the satisfaction of applying good workmanship to finish an article

Some demanding and challenging aspects of this career
- standing most of the day
- health hazards as a result of toxic chemicals being used

Purpose Orientation
A furniture polisher should be/have:
- average physical strength
- good eyesight
- good eye-hand coordination

- manual dexterity

School Subjects
An Ordinary Level Certificate

Compulsory Subjects: Mathematics and at least two other subjects are required, as a minimum level of education.

Recommended Subjects: Mechanical Technology

Training
Register with an employer providing suitable training.

Employer
- furniture manufacturers
- construction companies
- suppliers of wood
- self-employment, with enough initiative and capital, can start own business

A good trade qualification is essential for advancement from basic furniture polisher or machine operator to designer and senior levels of management in the furniture industry. A polisher can, with hard work and ability, reach the position of supervisor or workshop foreman.

Career 25: Glass Blower

Glass blowers use a blowpipe to shape glassware from globs of molten glass. They produce anything from unique ornaments and tableware to scientific equipment.

Glass is one of the most versatile materials available to man and is made from the cheapest materials on earth - sand. Although glass makers have been making glass since cradle of civilization, it was not until the late 15th century that they began to produce, amongst others, better lenses for spectacles, the first microscopes and scientific equipment.

Roughly, the development of glass making and blowing took place as follows:

- 3000 BC - early glass making was discovered when someone lit a fire on a place where the sea used to be and the soda and silica in the sand melted to form droplets of glass
- 300 BC - mould pressing was introduced by pouring molten glass into a lower mould and an upper mould was then pressed into it, thus shaping the glass
- 1st century BC - the invention of the blowpipe and glass blowing began
- 12th century - stained glass was first used
- 14th century - crown glass - flat window glass - was first used
- 15th century - clear glass, which was not really very transparent
- 17th century - plate glass
- 1675 - flint glass leading to the discovery of glass known as lead crystal
- 1884 - Jena glass containing boron silicate - now known as Pyrex
- 1909 - safety glass
- float glass

Many new types of glass, such as laminated glass, heat resin glass and glass fabrics, were developed. Some glass blowers shape and attach hot glass to other objects forming pedestals and handles.

Glass is in everyday use and the trend is becoming increasingly apparent that people enjoy owning glass objects of beauty, whether it is a tiny elephant blown by a glass blower in an open-air market, or a magnificent glass sculpture.

There are endless opportunities in this career and even people who are not very artistic but enjoy working with glass, could work at glass instrument making for scientific apparatus, or work in the glass blowing industry.

The two main areas within the glass industry are:

- the manufacture of flat (float) glass, mainly for the building industry
- the manufacture of glass products, mainly domestic and scientific glassware.

Glass workers operate and control machines to make molten glass, and press or blow it into moulds to form or shape glassware products, for example bottles, jars and drinking glasses, as well as insulation and fibreglass products.

Glass workers may perform the following tasks: process raw chemical and glass materials; handle glass fibres to form a continuous length and then produce a usable customer product. They check conditions such as temperatures, pressures and gas compositions by adjusting valves on furnaces to regulate the temperature of molten glass according to production specifications and setting screws, air valves, turntable rates and the timing of plungers in glass pressing machines.

They also need to identify, correct where possible, or report breakdowns in the processing equipment, as well as oil and clean the machines. They undertake quality assurance activities and prepare written operational records. Finished products are checked for faults, the faulty items are separated out and good products packaged for distribution.

Glass workers may specialize as melt operators, glass machine attendants, glass makers or glass handlers. With experience and sometimes further training, it is possible to become a team leader, supervisor, sales representative, estimator or technical specialist.

Some fulfilling and satisfying aspects of this career
- creating beautiful items
- seeing the finished product
- working with your hands

Some demanding and challenging aspects of this career
- concentration needed for long periods, due to the potential dangers of heat and chemicals
- possible eyestrain and physical exhaustion

Purpose Orientation
Glass workers should be/have;
- artistic and imaginative
- able to visualize objects three-dimensionally
- good eyesight
- enjoy working with your hands
- interest in working with machines

- good at solving practical problems
- physically fit

School Subjects
Ordinary Level is the minimum level of schooling required

Compulsory Subjects: None
Recommended Subjects: Visual Arts, Physical Sciences

Training
Certificate in Art

In-service training may be provided under the supervision of an experienced glass blower

Employer
- manufacturers of glass utensils
- glass blowing industries
- manufacturing and packaging industries
- glass merchants and glass processors
- self-employment, with enough experience, initiative and capital, can start own glass blowing business

Career 26: Glass Instrument Maker

Glass instrument makers manufacture and repair glass appliances and instruments for use by scientists and researchers in experiments.

They manufacture scientific apparatus according to the specifications of the scientist requiring the apparatus, or according to standard specifications. Other specifications are usually given in the form of a sketch. Sometimes glass instrument makers design the instruments themselves.

The work of glass instrument makers involves the bending and forming of glass tubes, the blowing of reactor valves and the forming of gas waste-pipes, the partial machining of basic glass components and taps, as well as the mounting of such components by melting them together to form a complete apparatus. They make use of various techniques in the formation of glass components.

Some fulfilling and satisfying aspects of this career
- being able to design and provide the required instruments
- seeing the finished product
- working with your hands

Some demanding and challenging aspects of this career
- concentration needed for long periods, due to potential dangers of heat and chemicals
- frustration when a piece breaks

Purpose Orientation
- good eyesight
- somewhat artistic
- dexterity
- enjoy making things with your hands
- able to visualize objects three-dimensionally.
- interest in working with machines
- good at solving practical problems
- physically fit

School Subjects
Ordinary Level Certificate, although a higher qualification is recommended

Compulsory school subjects: None
Recommended school subjects: Mathematics, Physical Science, Visual Arts

Training

Training covers a period of from two to four years, depending on skill and theoretical knowledge. Practical and theoretical training are included.

Employer

- universities and research institutes
- glass blowing industries
- self-employment, with enough experience and capital, can start own glass blowing business.

Career 27: Glazier

Glaziers fit or replace glass and mirrors in buildings and vehicles. They work with glass or other window materials such as plastic.

Glaziers first obtain details of their customer's requirements before commencing work. They then remove any broken glass that must be replaced and measure the area to be fitted with new glass. They obtain the type of glass or mirror to be used, in accordance with the customer's wishes and their own expertise. They cut it to the correct size and shape with a diamond or wheel cutter, sometimes using a pattern, and bevel (smooth) the edges. Then putty, rubber strips or wooden beading is used to fit the glass into the frame, or to attach the mirror to a wall with suitable fixing devices.

Glaziers work with, and need to know about, all types of glass, such as plate, toughened, laminated, tinted or opaque, as well as mirrors. They must work according to current building standards (or vehicle safety standards in the case of windshields etc). In addition to windows, glaziers work on glass roofs / walls and double glazing. They need to have a good head for heights as much of their work will be done on high-rise buildings.

Some fulfilling and satisfying aspects of this career
- working with your hands
- being active, working outdoors
- offering an efficient service

Some demanding and challenging aspects of this career
- having to work at great heights on occasion
- frequent standing, stooping and lifting
- possibility of injury on the job
- sometimes having to work in hot, cold, dusty or noisy environments
- sometimes having to work overtime on weekends and public holidays to meet deadlines and schedules

Purpose Orientation
- able to work both on your own and in a team
- be accurate
- have a good head for heights
- be safety conscious and careful
- have a steady hand
- able to work with your hands, using various tools, machinery and equipment

- get things done in a practical and efficient way

School Subjects
Ordinary Level Certificate is recommended.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Engineering and Graphic Design

Training
Apprenticeship

Employer
- contractors and home-builders
- businesses that do their own construction and alterations
- manufacturing and mining concerns
- insurance companies
- vehicle repair shops
- self-employed

Career 28: Goldsmith and Jeweller

Jewellers and goldsmiths fabricate and repair jewellery such as rings, brooches, pendants and bracelets. They use fine precision tools to cut, saw, file and polish jewellery.

The jewellery manufacturing industry can be divided into two types of production:

- Craftwork: Individual articles that are hand-made by skilled craftsmen

- Mass production: Moulds and machines are used in order to produce a large number of articles in the shortest time possible.

Jewellers who work in jewellery stores and repair shops provide a variety of services to their customers. Much of their time is spent repairing jewellery and watches and doing hand engraving. Typical repair jobs include enlarging or reducing rings, resetting stones and replacing broken clasps and mountings.

Some jewellers also design jewellery to be made either by hand or mass-produced. They make moulds to cast jewellery and dies to stamp it. Other jewellery workers may do the finishing work such as setting stones and engraving. A small number are also qualified gemmologists, who identify, appraise, classify and discriminate between all kinds of gems, including diamonds.

Jewellers and goldsmiths shape the metal with hand tools or cast it in moulds, to their own designs or those created by designers. They then solder together individual parts to form the finished piece. They may cast designs in precious metal and mount diamonds or other stones on the piece.

Jewellers and goldsmiths use pliers, files, saws, hammers, torches, soldering irons and a variety of other hand tools. They also use chemicals and polishing compounds, such as jeweller's rouge, for soldering or finishing.

Jewellers / goldsmiths work indoors at jewellery manufacturing concerns, retail jewellers' / goldsmiths' and at repair shops. The environment is usually pleasant, hygienic and well equipped.

Some fulfilling and satisfying aspects of this career
- being creative
- doing precise detailed work
- pleasant working conditions

- working with the public

Some demanding and challenging aspects of this career
- the possibility of eye-strain resulting from a lot of detailed work
- the total concentration required when working with tiny objects
- working on one's own
- sitting for long periods of time, as well as physical and mental strain

Purpose Orientation
A goldsmith and jeweller should be/have:
- artistic ability
- patient, accurate and neat worker
- perseverance and concentration
- careful and reliable
- mechanical, technical and practical aptitude
- enjoy precise, detailed work
- excellent eyesight
- good manual dexterity
- eye-hand coordination

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course
Ordinary Level Certificate for learnership

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Visual Arts, Mathematics, English

Training
Diploma in Jewellery Manufacture and Design. This includes practical training as well as training in Gemmology (training in the identification, classification and discrimination amongst all kind of gems).

There are four recognised learnerships:
- Precious metal working and mounting - 5 years (Including diamond mounting)
- Diamond and jewel setting - 5 years
- Engraving - 4 years
- Mounting and precious metal working - 3 years

Employer

- jewellery manufacturers
- retail goldsmiths and jewellers
- jewellery, clock and watch repair shops
- self-employment, skilled and entrepreneurial goldsmiths and jewellers can start their own businesses

Career 29: Gravure Machine Operator/Lithographic Machine Minder

Gravure machine operators are in charge of printing machines and are primarily responsible for making the necessary adjustments to ensure the highest quality of printing possible.

Gravure machine operators' tasks include the setting up of the printing machine, using printing cylinders prepared by photogravure engravers. They also clean the inking system and oil the machine; lock the printing cylinder into position on the machine; and fill the ink trough and regulate the flow of ink. They thread the paper through the machine guides and rollers; adjust the rollers and cutting mechanisms, then set and adjust the scraper blade to remove excess ink from the cylinder surface. Finally, a trial run is made to check legibility and printing uniformity.

When everything is in order, the machine is restarted and brought to full speed to commence printing. The printing, folding and cutting procedures also need to be checked for correct functioning.

Some fulfilling and satisfying aspects of this career
- working with your hands
- satisfaction of producing even print
- working in a relatively clean setting

Some demanding and challenging aspects of this career
- possible boredom from routine on one machine
- standing or walking most of the day
- noise from the machines

Purpose Orientation
A gravure machine-minder should:
- give attention to detail;
- enjoy working with his hands;
- be a neat and accurate worker;
- be technically inclined;
- have manual dexterity.

School Subjects
Ordinary Level Certificate for a learner - or learnership at a company.

Compulsory Subjects: None
Recommended Subjects: None

Training
Prospective gravure machine-operators can qualify in two different ways:

- by serving a learnership at a company where they receive practical in-service training (Competency- Based Modular Method) under the supervision of skilled tradesmen, while theoretical classes are conducted through the Distance Learning Department of the Southern African Printing College
- by attending the full-time 6 months course at the Southern African Printing College, where both practical and theoretical teaching / training is done (Competency-Based Modular Method). After the successful completion of the course students have to be enrolled as learners for a minimum of 66 weeks before being allowed to do the Final Competence Test.

Employer
- Commercial printing plants
- Book and magazine publishers
- Newspaper plants
- Stationery and envelope manufacturers
- Government departments e.g. Government Printing Works
- Manufacturers and other firms that do their own printing

Career 30: Gunsmith

Gunsmiths use hand-tools and machines to repair, build and modify firearms according to customer specifications and blueprint orders.

Handguns and long-guns consist of three basic elements: stock, barrel and firing mechanism. The pieces are usually made by parts manufacturers, but gunsmiths may make pieces to restore antique guns or for special custom-made guns.

Gunsmiths protect and treat the metal pieces of a firearm. This process is called "bluing". They first strip the old finish from the barrel and then place the metal parts in a bluing salt bath. This gives the metal a bluish colour and a rust resistant surface. Some gunsmiths send their guns to gunsmiths who specialize in such work. Gunsmiths also cut new rifling into barrels of small firearms with a broaching machine, making the calibre of the bore larger.

Gunsmiths also display their special skills in customized work - for instance, hunters often require gunsmiths to make a particular rifle for them, from blank factory pieces. After assembling the pieces, the gunsmith always test-fires the gun to check the alignment and strength of the gun.

Some fulfilling and satisfying aspects of this career
- designing and making quality firearms
- rendering a service to hunters, gun collectors, etc.
- working with your hands
- creativity

Some demanding and challenging aspects of this career
- working long hours
- the noise of shooting
- being on your feet for long periods is tiring
- the potential dangers of handling weapons

Purpose Orientation
Gunsmiths should be/have;
- good with your hands
- enjoy designing and working with guns
- mature and emotionally stable
- take pride in quality work
- meticulous and precise worker

- safety conscious, responsible, and never a show-off
- able to communicate well

School Subjects
No minimum requirements

Compulsory Subjects: None
Recommended Subjects: Physical Sciences

Training
In-service training may be provided by an experienced gunsmith.

Employer
- shooting ranges
- gun shops
- sport stores
- self-employment, with enough experience and capital, can open own gun shop

Career 31: Handyman

Handymen repair and maintain buildings, mechanical equipment, machines, electrical equipment, heating and air-conditioning systems and even plumbing. Handymen will repair anything but need to recognise when they are unable to fix a problem and need to consult a specialist for assistance

Handymen work in various settings. They can be employed in hospitals, colleges, offices, apartment buildings, factories, schools, stores and malls. In small establishments, they are responsible for all types of maintenance, while in large establishments they usually specialise in a particular field.

By preventing equipment from breaking down and deteriorating, handymen aim to solve minor problems before they become more serious ones. They keep records of repairs undertaken and the dates when equipment was last repaired, inspected or serviced. This helps them to establish an inspection and repair schedule, eg for replacing filters and for oiling moving parts on machinery. Beginner handymen are given simple tasks, such as changing light bulbs, and as they acquire skills, they are given more and more complex tasks, eg repairing air-conditioning motors.

Work is usually indoors, using tools such as spanners, hammers, drills, testing equipment etc.

Some fulfilling and satisfying aspects of this career
- by delivering good service you can expand your business by word of mouth
- building up a large client base
- self-employment

Some demanding and challenging aspects of this career
- having to be on call 24 hours a day
- often requiring hard, physical labour
- having to travel a lot can be tiresome

Purpose Orientation
- have mechanical aptitude
- be helpful and thorough
- good with your hands
- physically strong
- good communication skills

School Subjects

Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College has its own entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences for a university of technology course
Recommended Subjects: Engineering and Technology

Training
Diploma

Employer
- government agencies
- maintenance companies
- self-employment

Career 32: Industrial and Manufacturing Engineer

Industrial and manufacturing engineers utilize the principles and techniques of engineering, industrial economics and management in order to design efficient production and manufacturing systems.

They plan and design plant layouts and facilities, study new machinery and facilities and recommend or select efficient combinations. They develop flexible or integrated manufacturing systems and procedures. They conduct studies and implement programmes to determine optimum inventory levels for production and to allow optimum utilization of machinery, materials and resources. They analyse production costs and they design, develop and conduct time studies and work simplification programmes.

They also determine human resource and skills requirements. They develop training programmes, performance standards, evaluation systems and wage and incentive programmes, and they conduct studies on the reliability and performance of plant facilities and of production or administrative systems. Furthermore, they establish programmes and conduct studies to enhance industrial health and safety or to identify and try to eliminate fire and other hazards. They assess industrial facilities and they may supervise technicians, technologists, analysts, administrative staff and other engineers.

To carry out all of these tasks industrial engineers first define the problems, plan investigations, process information and finally, implement their plans.

Areas of activity may include one or more of the following:

- Management and operations
- Facilities layout
- Plant design and location
- Industrial production planning
- Operations research
- Environmental considerations
- Production and quality
- Performance and operational standards.

In more detail, their activities include the following:

Manpower assessments and valuations of job positions, including organizational studies: industrial engineers need to define the number of people, the level of training and remuneration for every position to ensure the optimum operation of a particular system. At the same time, the organizational relationship between the various positions must also be developed.

Technical studies involving layout planning, organization and work studies: this also involves investigating the replacement of equipment, solving problems in the handling of materials, determining the characteristics of operational equipment, low-cost automation, value analysis

and so forth. In this regard, digital computers are very useful.

Development and implementation of industrial systems: this involves the development, testing, evaluation and on-going improvement of industrial systems to enable management to achieve long-, medium- and short-term plans.

Economic feasibility studies to measure all results in terms of dollars and cents: various techniques are available for the economical evaluation of technical plans and the comparison of various alternatives. In this regard, computers again play an important role.

Operations research studies with computerized application of techniques such as linear and dynamic programming, simulations, stock control and replacement theory: replacement theory looks at industrial problems in areas such as production flow, facility and raw material planning.

Project management: in the implementation of new projects comprising major construction work, it is vitally important that work progress be monitored against the commissioning date of the project.

Quality control and production management: this includes production planning, control and updating production and maintenance standards, as well as the setting up of control systems to ensure that products are manufactured to set standards.

Industrial engineers usually work normal office hours in pleasant conditions, with many other people doing different jobs at different times. They generally work indoors in offices, drawing offices and conference rooms. They also observe all aspects of the production process. Work settings therefore are varied since there are many different kinds of manufacturing plants. Industrial engineers' tasks are not only to make companies run efficiently and cost-effectively, but also to devise new ways of improving current conditions, methods, and equipment or machinery.

What is needed to excel in industrial engineering is a vast knowledge of how to use the materials and harness the forces of nature through scientific knowledge and information, in order to produce the goods and services people use and need to improve their living conditions, welfare and safety.

Engineering graduates usually begin work under the supervision of experienced engineers and are gradually given more responsibilities as they gain experience. Some engineers with experience and additional education move into administration or management. Many high-level executives in industry began their careers in engineering.

Industrial Engineering Technician
Industrial engineering technicians assist professional engineers, or act independently to ensure that the best use is made of material, equipment, capital and labour.

Industrial technicians are involved in many different occupations. These may include many different areas of manufacturing, which may be attached to research, design, development,

construction, installation, maintenance, marketing, sales and management. They could specialize, for instance, in different aspects of metallurgical engineering, for example, the production of metal from raw material (iron from iron ore), refining (iron to steel), milling (rolling ingots into finished or semi-finished products), or the maintenance of machinery.

Industrial engineering technicians' activities can be divided into three main categories:

Technical Studies: layout planning, quality control systems, process capacity, low cost automation of implements and work study

Production Systems: production planning, scheduling, simulation, process planning

Industrial Systems: development, testing evaluation and implementation of systems, systems using microcomputers

Industrial Engineering Technologist

Industrial engineering technologists occupy themselves with problems concerning the optimal utilization of personnel, raw materials, equipment and capital in the production of goods and services. Emphasis is placed on the application of industrial processes and personnel management and on the implementation of integrated systems. Both engineering and business administrative duties are performed.

Their objective is to ensure profitability by improving production processes, by focusing attention on factors such as production control, cost and quality control, time and motion studies, work methods and statistical analyses.

Their work involves planning the layout of machinery and equipment, as well as the flow of work. Industrial engineering technologists act as coordinators between management and specialist departments and they make recommendations to management. They may be appointed as a production manager and could be employed in any industry where products are manufactured, or where services are provided.

Some fulfilling and satisfying aspects of this career
- solving problems
- the challenge and variety of the work
- good salaries and promotional opportunities

Some demanding and challenging aspects of this career
- working with demanding or overly critical people
- having to assume a lot of responsibility and the stress that this involves
- the long period of preparation and study required to register as a professional industrial engineer
- having to continue your education throughout your career to keep up with the latest technological advances in your field

Purpose Orientation

An industrial engineer should:
- have above average mathematical and scientific ability;
- be curious and creative;
- have the ability to solve problems on your own;
- communicate well in speech and writing;
- have good judgement and self-discipline;
- be adaptable and work well with others;
- be practical, orderly and systematic;
- have an analytical mind and excellent technical skills
- have computer skills

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Economics, Information Technology, Engineering and Technology

Training
Degree: courses in Industrial Engineering

Employer
- Parastatals
- Mines
- Explosives and Chemical Industries
- Large industries
- Government departments
- Municipalities
- Hospitals
- Universities and universities of technology
- Self-employment, with enough experience and initiative, can set up own business

Career 33: Industrial Designer

Industrial designers design consumer articles in response to a recognized need for a new product, or may improve on an existing product. They specialize in any one of many fields, ranging from household equipment such as utensils, appliances or furniture, to more specialized equipment such as cars, the interiors of aeroplanes or medical equipment.

Their role mainly requires expertise in the overall conceptualization, interaction with products and the design of their appearance.

Their work covers all spheres of industry. Industrial designers combine artistic talent with a knowledge of marketing, materials and methods of production to create new products or improve the appearance and functional design of existing products.

Industrial designers apply their creativity and technological expertise in designing articles that are functional and at the same time, satisfy the user's need for aesthetic appeal. They have to consider elements of practicality, marketing and manufacturing as well as the comfort and safety of the user.

When a product is designed, the first priority is to establish the main function of the product. This involves a study of all possible problems as well as an analysis of relevant research data. Designers use this information to prepare a brief on the design to avoid duplication and to ensure that the new products are better than the previous or existing ones.

Key factors to be considered are function, user friendliness, appearance, cost, safety, maintenance, marketing strategies and competitiveness with other products. They have to produce technical specifications for the new product, the estimated cost and the restriction of the design. After the brief has been prepared, designers start working on the actual design.

They make sketches, models and drafts using drawings. They are not able to express themselves freely, but work within the confines of the brief, available technology and the client’s marketing plan. They present their ideas to their client who considers them and decided whether the proposed design satisfies his/her conditions. If the client accepts the design, the designer prepares the final specifications and drawings for the production of the article.

Industrial designers are also involved in the progress discussion, planning as well as quality control. In some cases, industrial designers can be involved with the gathering of information on how an existing product compares with competing products, the needs of users and fashion trends. They may then sketch a variety of designs and consult with managers, engineers, sales and marketing personnel and others, about the feasibility of each idea.

They make a model of the design selected by the company management. After any necessary revisions a final prototype is made with the material to be used in the finished product. The approved prototype is then put into production. Consumer testing by means of market research is important at all stages to assess consumer reaction, in order to determine the acceptability of the

product and the need for any changes.

Industrial designers specialize in the following areas:

Consumer Appliance Designers: are involved in a design team that develops products and appliances to assist or entertain in the home or office (i.e. white goods, electronic goods, computer equipment and so on)

Furniture Designers: create designs for the manufacture of domestic, commercial and industrial furniture

Transport Designers work in large teams putting shape, style and comfort into cars, trucks, trains and trams

Industrial designers work mostly indoors, usually in clean, well-lit and well-ventilated rooms, where they spend their time in front of a drawing board making sketches. They also work in workshops when making models.

Some fulfilling and satisfying aspects of this career
- pleasant working conditions
- good salaries
- the opportunity to use creative and artistic talent
- variety of work tasks

Some demanding and challenging aspects of this career
- having ideas rejected
- working under pressure
- working long hours
- sometimes having to travel extensively
- visiting clients and factories

Purpose Orientation
An industrial designer should be/have:
- artistic and creative, yet practical
- ability to draw and build models
- able to communicate with people on all levels
- able to translate abstract ideas into tangible designs
- friendly and tactful, especially when dealing with clients
- technical aptitude
- sound engineering knowledge
- familiar with plastics / timber / metal and composite materials
- understand and meet the needs and tastes of the public
- sound understanding of marketing, sales work and other business activities
- able to handle rejection of ideas
- good vision and manual dexterity

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Students are selected on the basis of a portfolio, a practical entrance examination and an interview. Drawing as well as creative abilities are considered very important.

Compulsory Subjects: Mathematics
Recommended school subjects: Physical Sciences, Visual Arts, Information Technology, Engineering and Graphic Design

Training
Diploma: Industrial Design

Post-graduate study: MTech. Industrial Design recommended to develop the necessary competencies for entering the industrial design profession.

Employer
- factories and manufacturers of mass produced goods
- all branches of industry
- shop-fitters and furnishers
- architectural and interior designers
- colleges, universities and art schools
- design consultants and studios
- printers and publishers
- marketing organizations
- self-employment, working independently and receiving assignments from clients, or develop ideas or inventions and negotiate with manufacturers through license agreements.

Career 34: Industrial Economist

Economists study the ways societies use resources such as land, labour, raw material and machinery to produce goods and services. Industrial economists focus on the effect of factors such as government policy, international trade regulations and labour relations on the sectors in which businesses operate.

Industrial economists consider all social, political and other factors (locally and abroad) that have an effect on the economy. At least four different types of industrial economists can be identified:

Those employed at large corporations on a full-time basis gather information, assess the impact of industrial economic factors on the organization and advise top management accordingly.

Those at educational institutions conduct on-going research and deliver lectures. Their approach to the subject should be creative and they may develop original economic theories based on research. Large corporations sometimes seek the professional advice of these economists.

Techno-economists are research-orientated. They usually have additional qualifications in a technical or scientific field.

Business economists are employed by corporations in the private sector as financial, marketing, production or general managers. Their responsibility is to identify areas of potential benefit or disaster and make recommendations to senior management.

Some fulfilling and satisfying aspects of this career
- working with others
- wide range of specialized skills available
- being consulted for your opinion

Some demanding and challenging aspects of this career
- detailed work
- responsibility of knowing that information provided could have serious financial and other implications
- getting predictions wrong sometimes

Purpose Orientation
An industrial economist should:
- have good literacy and numerical skills;
- have verbal and written communication skills;
- understand statistics and data manipulation;
- have a methodical and inquiring mind;
- have initiative and an interest in local and international economic affairs;
- creative, thorough and analytic approach to problem-solving
- accurate and objective
- enjoy detailed work

- mathematical ability and abstract reasoning
- able to analyze and interpret information.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics
Recommended Subjects: Economics, Business Studies, Accounting

Training
Degree: Various degrees with appropriate subjects.

Post-graduate study: Postgraduate degrees in Economics or Business Economics, will enable economists to get promotions more readily and will qualify them for more responsible research and administrative positions as well as for permanent teaching positions in universities and universities of technology.

Employer
- Universities and universities of technology
- Research organisations
- Large companies
- Manufacturing firms
- Mines
- Agricultural firms
- Financial institutions
- Marketing firms
- Consulting firms
- Government departments
- Self-employment - the experienced industrial economist can open his own business and work as a consultant.

Career 35: Industrial Nurse

Industrial nurses render first aid and treatment to injured or ill employees at factories, mines, construction sites and other places of employment.

They may, for example, sterilize, disinfect, anoint and bandage minor cuts and burns. They may apply artificial respiration or administer oxygen in cases of suffocation or asphyxiation. They administer medications such as aspirin to relieve pain or antiseptic solution to prevent infection until patients can receive more intensive health care. They may monitor the taking of prescribed medicines and treatments for various illnesses.

If the company or mine has an infirmary the industrial nurse may be required to change beds, clean equipment and generally keep the infirmary in an orderly condition.

Industrial nurses also assist doctors who may be called out to attend emergency situations on site and have to keep personal and medical records of all employees.

Some fulfilling and satisfying aspects of this career
- helping others
- working with people
- the challenge and variety of work
- a large degree of autonomy

Some demanding and challenging aspects of this career
- being called out for emergencies
- routine duties
- dealing with difficult people

Purpose Orientation
An industrial nurse should:
- have compassion and patience;
- have common sense;
- be tactful;
- be responsible;
- have a sense of humour;
- be able to act calmly in an emergency;
- want to be of service to people;
- able to assume responsibility and a leadership role;
- have good health and physical fitness.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences

Training
University courses for nurses

Training at nursing colleges is both practical and theoretical, often in collaboration with a university. Clinical or practical training is done at accredited training hospitals. The duration of the course is 4 years.

Qualified nurses register with their country's Nursing Council.

Employer
- Factories
- Mines
- Construction companies
- Large companies

Career 36: Industrial Psychologist

Industrial psychologists study human behaviour in the work environment and are especially concerned with the adaptation and development of employees. They are appointed by large organizations to fulfil the general industrial psychology function of the organization, which involves the study of organization -employee interfaces and subsequently applying psychological principles so as to maximize satisfaction and productivity in the work environment.

Their responsibilities can include:

Recruitment: this involves the recruitment, selection and placement of the best candidate for the position, in the organization. Effective selection processes can save the organization unnecessary personnel expenses. Placing is done on the basis of candidates' personality profiles, experience, personal preferences, abilities, qualifications and the needs of the organization. Industrial psychologists use psychometric tests, interviews and assessment centres as aids in the selection process.

Training: all organizations need personnel who are fully qualified to complete their work successfully. Industrial psychologists may be involved with training newcomers to the organization to be competent and to fill a specific position. They may also see to it that members undergo sufficient training for promotion to management or positions requiring greater responsibility.

Career Development: Industrial psychologists assist employees with the planning and development of their careers.

Job Design and Analysis: The design of the structure and content of jobs can have an enormous influence on the productivity, motivation and morale of employees. Thus industrial psychologists are tasked to ensure the complete and accurate analysis and design of all jobs within the organization.

Organization Development: Industrial psychologists identify personnel and system deficiencies and correct the problems, thus ensuring continuous development and renewal within the organization.

Personnel Administration: including payment of wages and the handling of leave and transfers in such a way that employees remain motivated to be productive in their work environment.

Labour Relations: Labour relations have a tremendous influence on the organization as well as the economy in general. In many cases, it is the responsibility of industrial psychologists to defuse and prevent labour unrest.

Ergonomics: Industrial psychologists need to ensure that the physical work environment is safe and pleasant for employees to do their work and be productive.

Considering that wages and salaries are one of the highest expenditures within a company, industrial psychologists need to ensure that minimum loss occurs due to failure of personnel deployment. They must be sensitive to the interests and needs of employees, as well as management.

Some fulfilling and satisfying aspects of this career
- working with people and helping solve problems
- prestige status and good remuneration

Some demanding and challenging aspects of this career
- keen professional competition
- many years of study to meet professional requirements
- dealing with clients who show little progress

Purpose Orientation
- sincere interest in people
- able to balance the interests of employees and the organization
- able to work on inter-personal levels with a large spectrum of people
- mature, with strong sense of responsibility

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Differ from one university to another
Recommended Subjects: Mathematics, Life Sciences, Geography, History, Economics.

Training
Degree: BCom, BA or BSc - Industrial Psychology

Post-graduate studies: essential - Masters degree in Industrial Psychology

Training consists of five years academic training at a university and an internship of twelve months at an approved organization. The minimum qualification required for registration at the Health Professions Council as an industrial psychologist, is a masters degree in Industrial Psychology.

Employer
- large companies and organizations
- self-employment, with enough experience and initiative, can set up own consultancy practice

Career 37: Industrial Technician: Hydrometry

Industrial technicians are responsible for the planning and design of storage dams, canals, tunnels, pipelines and pumping and irrigation schemes. They are also responsible for the preparation of cost estimates, economic calculations and reports on water schemes and for the measuring and computing of hydrological data.

Industrial technicians give advice to irrigation boards, municipalities and farmers on irrigation matters. They survey the sites for new hydrological measuring stations and are involved in the design, maintenance and improvement of existing measuring structures and instruments.

Industrial technicians prepare and survey sites for flood calculations and make flow measurements, using instruments to calibrate measuring points. They assist engineers and hydrologists and spend a great deal of time out of the office collecting and processing data.

Some fulfilling and satisfying aspects of this career
- being responsible for feasible usage of water in an efficient and safe manner
- working mostly outdoors and in rural areas
- some possibility of self-employment

Some demanding and challenging aspects of this career
- lots of on-site work where overnight stays might be necessary
- working in adverse weather conditions

Purpose Orientation
An industrial technician in hydrometry should:
- have mathematical and scientific aptitude;
- have good observation and supervisory skills;
- have good interpersonal relations;
- able to work independently and as part of a team;
- be computer literate;
- be willing to work outdoors and even live in the field, if necessary.

School Subjects
Advanced Level Certificate

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Geography, Mechanical Technology

Training
Diploma in Civil Engineering

Employer
- Department of Water
- agricultural unions
- self-employment, as a consultant

Career 38: Industrial Theatre Director

The industrial theatre business has grown rapidly because it serves as an innovative and non-threatening means of bringing about change within organizations. It is a uniquely flexible and vigorous medium that gets people laughing and talking about problems in the organization in an affable way.

An industrial theatre director spends a lot of time researching a play, getting the flashpoints of the organization and most of the dialogue from the people on the ground. He or she writes clues for the play and suggests solutions for problems without being didactic. The best place for the play to take place needs to be identified and this may be a corner of the factory or an office area.

Decisions are made about props and costumes, which may be only a large trunk and yellow overalls. The play is then rehearsed and presented, being directed "live" by the industrial theatre director.

Industrial theatre directors have to know how to conduct physical, interactive comedy. This is a highly kinetic form of theatre with few silences and directors need to choreograph the plays and make visual jokes in such a way as to punctuate and support the emotional progression and learning points. These directors also need to induct actors in the special demands and responsibilities of presenting industrial theatre.

Some fulfilling and satisfying aspects of this career
- challenge of writing specific plays for specific situations
- the camaraderie of working with people and actors
- knowing your work is helping employee / management relations in organizations

Some demanding and challenging aspects of this career
- being away on remote locations for long periods
- failing to get actors and/or audiences to convey or understand what needs to be done

Purpose Orientation
An industrial theatre director should:
- have acting talent;
- be creative and imaginative;
- be a quick thinker;
- be committed;
- direct players in the special demands and responsibilities of industrial theatre;
- able to take criticism well;
- have good health, physical strength and stamina;
- have a clear, well-trained voice.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Drama Arts, Music, Visual Arts, Languages

Training
Degree: Drama and Theatre Arts

Diploma: Drama Studies

Employer
- Industries
- Organizations
- Councils for performing arts
- Television and Film industry
- Freelance work

Career 39: Industrial Analyst

An industry analyst collects and analyses data in order to evaluate existing and potential product and service markets. It is their responsibility to identify and monitor competitors and research market conditions or changes in the industry that may affect sales.

Industry analysts in the computer field analyse and report on industry trends for industry or investment publications and brokers. They analyse the performance of companies and advise on opportunities for investment. They recommend which companies to invest in, how much to invest, and whether to increase, hold or sell their stocks.

Industry analysts compile information on the whole industry or on particular companies, and this information is used by investors, economic planners, government agencies and other companies in the industry. They seek investment opportunities in companies and investigate areas such as financing, development of products, market plans, management capabilities, competition and buy-outs of smaller companies. They also check for potential problems in a company such as product portfolios, balance sheets and market share. They usually work in their own offices and make presentations in boardrooms and meeting rooms.

Some fulfilling and satisfying aspects of this career
- highly paid profession
- exposed to interesting aspects of the stock market
- satisfaction of seeing your clients prosper from your advice
- comfortable working conditions

Some demanding and challenging aspects of this career
- stressful if you have given the wrong advice
- having to deal with demanding and difficult clients
- working long hours, especially when working on proposals for clients

Purpose Orientation
- good computer skills and knowledge
- able to work well with people
- mathematically and financially inclined
- analytical, diagnostic and problem-solving skills
- good communication skills
- self-disciplined and methodical
- good concentration abilities

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics
Recommended Subjects: Information Technology

Training
Degree: BCom with subjects such as Information Technology, Business Management, Investment Management, Statistics

Employer
- computer companies
- brokerage firms
- trade publications
- economic planners
- government agencies
- banks, stock exchange
- investment research companies

Career 40: Inspector of Occupational Safety

Inspectors of occupational safety have a very important function in the prevention of injuries and losses as a result of accidents. The responsibilities of these inspectors depend on where they work. Those who work for the Department of Labour, ensure that the requirements of the Law on Machinery and Occupational Safety are adhered to.

Inspectors of occupational safety in private companies formulate, administer and make the necessary adjustments to accident prevention programmes in order to effectively prevent accidents. They provide daily, weekly or monthly reports on the status of their organization's accident prevention programmes to management. They also compile standards for the safety of appliances and check them regularly.

One of their most important tasks is to update accident, injury or illness records. They must also investigate and report all accidents and incidents. The conditions that contribute to accidents must be rectified, if possible, so that they do not recur.

Inspectors of occupational safety need to be present at all inspections by the Department of Labour. They also do their own inspections to ensure safety and make recommendations regarding accident prevention at plants and regarding the specifications for new buildings. They ensure that repairs and modifications to existing structures are carried out, where necessary, to meet safety requirements.

Some fulfilling and satisfying aspects of this career
- improving safety standards so as to prevent the occurrence of work-related accidents, injuries and diseases that result from sub-standard products and methods
- working both in an office and outside
- working with people

Some demanding and challenging aspects of this career
- ensuring that inspections conform to prescribed rules and regulations
- having to visit the scenes of tragic accidents
- keeping up-to-date with new developments and technology in this field

Purpose Orientation
- good interpersonal relations
- scientific and technical knowledge, and interest
- very responsible and conscientious

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or college will have its own minimum entry requirements.

Compulsory school subjects: None

Recommended school subjects: Mathematics and Physical Sciences

Training
Diploma in Safety and Security Management

Before being appointed as an inspector of occupational safety, a prescribed practical training course has to be completed.

Employer
- Department of Labour
- large companies
- large factories
- self-employment, as a private consultant particularly to smaller companies

Career 41: Inspectors of Works

Inspectors of works ensure that the structural, mechanical and electro-technical aspects of building constructions are carried out in accordance with plans, specifications and to the required standards.

Inspectors of works may specialize in:

- enforcing the laws and regulations relating to design, construction and building procedures

- representing building societies and other financial institutions to ensure that buildings are erected in accordance with their requirements and the mortgage agreement

- ensuring compliance with specifications for construction, assembly and installation of components and products in the construction and in manufacturing industries

Inspectors of works carry out inspections, prepare reports and make recommendations, prepare cost estimates for specific jobs, and do valuations of specific properties.

They also draw up specifications and lists of materials for new works, as well as for building repairs, refurbishment and extensions. They may prepare cost estimates for specific jobs. In some instances, they are required to recommend progress payments to contractors and/or sub-contractors. They inspect jobs on completion and test the completed buildings or installations for compliance with the relevant specifications.

Inspectors of works are not only in charge of artisans, but also of contract workers, since private contractors do most of their work on a contract basis. Inspectors also work closely with architects and engineers.

Inspectors of works carry out their work in offices as well as outdoors on site, during construction and on completion of structures. They drive from place to place, usually in a car supplied by their employers. Since they are often outdoors or in partially completed buildings, working conditions may be unpleasant in bad weather.

Some fulfilling and satisfying aspects of this career
- the variety of the work tasks
- working in a responsible position without the need for advanced education
- being supplied with a car, or being reimbursed for distance travelled in your own vehicle
- helping to ensure public safety

Some demanding and challenging aspects of this career
- working in adverse weather conditions
- the time required to drive from one place of inspection to another
- having to deal with unpleasant or difficult people

Purpose Empowerment
An inspector of works should:
- be observant;
- get along well with others and be able to work with people at all levels;
- be objective and persuasive;
- be independent and self-reliant;
- be very responsible and have sound judgement;
- be able to criticize constructively;
- speak more than one language fluently;
- have an aptitude for figures.

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Engineering and Graphic Design

Training
Diploma in a relevant building, mechanical, electro-technical or engineering field

The requirements for appointment as an inspector of works are: a 3-year appropriate National Diploma or National Technical Diploma or equivalent qualification or registration as an engineering technician.

Employer
- Government departments - Water, Public Works, Land
- Provincial administrations
- Municipalities
- Engineering and assembly companies
- Financial institutions
- Quality control agencies
- Testing laboratories

Career 42: Instrument Maker

Instrument makers manufacture, install and repair instruments. Very high standards have to be met with regard to the design and production of instruments to be used by scientists, industrial organizations and academic institutions.

Instruments may be classified according to their use, as follows:

Mechanical instruments: used for mechanical purposes e.g. watches, thermometers, odometers and pressure gauges

Optical instruments: including spectacles, telescopes and cameras, the production of which requires a high degree of skill and accuracy

Electrical instruments: such as voltmeters, ammeters, kilowatt gauges and delicate electronic equipment

Chemical instruments: including very complex apparatus used in chemical engineering

Medical instruments and apparatus: such as scissors and pincers

The instruments have to be checked regularly and defects should be detected and repaired by an instrument maker.

Instrument makers work mostly indoors in designing and manufacturing plants. Working conditions depend on the field of specialization: mechanical, electrical, hydraulic, chemical or optical. In many cases control panels are in comfortable surroundings.

Some fulfilling and satisfying aspects of this career
- the opportunity to specialize
- variety of work tasks
- the challenge of designing new instruments
- the possibility of becoming self-employed

Some demanding and challenging aspects of this career
- the possibility of eyestrain resulting from doing detailed work
- the possibility of accidents or injuries on the job
- working overtime to get orders completed

Purpose Orientation
An instrument maker should:
- work meticulously;
- be very accurate and precise;
- have mathematical ability and mechanical aptitude;
- be diligent and patient;

- have good hand and finger dexterity;
- be practical;
- have good eye-sight;
- enjoy the design and manufacture of scale models.

School Subjects
Advanced Level Certificate

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Engineering and Graphic Design, Electrical Technology

Training
Register with an employer providing suitable training. Training consists of theoretical and practical work.

Duration of course: 5 years but it could be shorter if the candidate has higher educational qualifications.

Final examination: a compulsory trade test set by the Department of Labour to qualify as an artisan.

During learnership training, emphasis is placed on the safety measures that are related to electrical work, poisonous or flammable gases, the use of hand-tools, the handling of melted or hot metals, fluids and gases under pressure, and the handling of machinery. Training covers a wide field and includes, amongst others, the following:

- Precision measurements - the use of precision measurement tools to make measurements according to sketches

- Turning work, the measurement of tools and tolerances, closure of appliances

- Manufacturing of instruments such as voltmeters, ammeters and galvanometers, as well as the installation and maintenance of instrument systems

Employer
- municipalities
- electrical factories
- manufacturing industries
- self-employment, with enough experience and capital, can start own business

Career 43: Instrument Mechanician

An instrument mechanician manufactures and repairs instruments and recalibrates old instruments. The instrument mechanician 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 may 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 mechanician diagnoses the fault and carry out repairs as quickly as possible.

Instrument mechanicians 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 mechanicians work according to sketches and instructions from scientists and engineers.

Some fulfilling and satisfying aspects of this career
- the opportunity to specialize
- a variety of work tasks
- the challenge of designing new instruments
- a chance to become self-employed

Some demanding and challenging aspects of this career
- the possibility of eyestrain resulting from doing detailed work
- the possibility of accidents or injuries on the job
- working overtime during emergencies
- sometimes working under noisy, warm, humid or dangerous conditions

Purpose Orientation
An instrument mechanician should:
- 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 eye-hand coordination;
- have good eyesight.

School Subjects
Ordinary Level Certificate
Some employers prefer higher qualifications.

Compulsory Subjects: None

Recommended Subjects: Mathematics, Physical Sciences

Training
Apprenticeship

Employer
- Telecommunication companies
- National Airlines (where applicable)
- Mechanical, electrical and chemical engineering concerns
- Electrical precision tool manufacturing industries
- Heavy engineering industry
- Iron and steel producers and the non-ferrous steel industry
- Municipalities
- Self-employment, working independently on a contract basis

Career 44: Knitting Machine Operator

Knitting machine operators process cotton, wool and similar forms of yarn into clothing, scarves and other articles. Their primary function is to attend to a number of industrial knitting machines.

Typical duties include:

- threading the machine
- setting the machine in motion
- lapping the end of the knitted cloth around the take-up roller
- observing the knitting process to detect yarn breaks, yarn defects and empty yarn packages
- tying broken yarn ends
- cutting and baling the knitted cloth.

Circular knitting machines are used in the production of knitted material. A knitter can operate from two to five of these machines simultaneously depending on the type of yarn used. Knitters are also required to clean and oil the machines every day and must notify the repair technician of any mechanical defects.

In factories where complete knitted garments are manufactured the knitter also has to: cut garments; machine sew parts together; make buttonholes and sew on buttons; and finish off garments.

Some fulfilling and satisfying aspects of this career
- working with your hands
- working as part of a team
- seeing the finished product

Some demanding and challenging aspects of this career
- boredom due to routine tasks
- working in a noisy environment

Purpose Orientation
A knitter should:
- be able to perform repetitive tasks;
- work accurately;
- be able to work as part of a team;
- be observant
- have good hand and finger dexterity.

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None
Recommended Subjects: Consumer Studies

Training
Clothing factories offer in-service training which normally lasts for approximately 3 years.

Employer
- clothing factories that manufacture knitted materials and clothing.
- self-employment, with enough money for your own machine, you can make knitted articles on a contractual basis, with more orders may be able to employ other knitters and start a small factory

Career 45: Leather Chemist

Leather chemists are scientists who apply their knowledge of chemistry, biochemistry and microbiology to develop the technology of leather production.

Leather manufacture is concerned with the conversion of raw cattle hide and sheepskins into the stable, useful and attractive product known as leather. Understanding this conversion process, called tanning, requires knowledge of Chemistry, Biochemistry and Microbiology.

Leather chemists are experts on the processing of all types of leather including the preservation of the hides, the tanning of the hides and the finishing of the leather. They also have expert knowledge of the quality tests that leather is subjected to.

A leather chemist can move into a senior supervisory and management position on the technical and production side

Some fulfilling and satisfying aspects of this career
- working with leather and chemicals
- seeing the finished product

Some demanding and challenging aspects of this career
- the smells in the tannery
- daily routine can be monotonous at times
- the prohibitive cost of setting up one's own tannery

Purpose Orientation
A leather chemist should:
- have mathematical and scientific aptitude;
- be interested in chemistry and biochemistry;
- like to work with leather;
- be creative in solving problems;
- have initiative and originality;
- have interest in working with tanning machinery.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences

Training
Degree: BSc in Chemistry or Biochemistry

Employer
- Tanneries
- Companies that supply tanning materials to tanneries
- Leather Industries Research Institute
- Self-employment, a leather chemist who specializes in high value leathers can start a business

Career 46: Leather worker

Leather workers use leather, imitation leather, plastics and other materials to make products such as clothes, handbags and shoes. There are four sections within the leather industry. These consist of tanning; shoe manufacturing, general leather goods and handbags.

Tanning: tanners use chemicals to prepare animal hides. The hides are soaked to remove the salt and treated with chromium salt or vegetable products to remove hair and flesh.

- Stakers, stretchers and togglers work on the hide to produce a satisfactory shape.
- Splitters use sharp knives to split the hides.
- Shavers remove the remaining hair.
- Sprayers uses special equipment to spray on different colours according to demand.
- Buffers buff the leather to impart a smooth surface

Footwear Section: employs by far the largest number of both skilled and unskilled labour:

- Clickers cut the leather material (the uppers)
- Lining cutters cut out the lining
- Skivers thin the seam edges
- Machinists sew the uppers and lining together
- Sole cutters and insole cutters cut out the various parts of the sole
- Pull toe lasters fit the uppers to lasts and join them by using lasting machines
- Sole attachers apply adhesive and sole stitchers stitch around the soles
- Heel attachers fasten on the heels
- Sole moulders apply rubber soles where required
- Edge trimmers trim the soles and heels and smooth rough edges
- Bottom scourers polish the soles
- Inkers apply dye to obtain the desired colour

General leather goods section: includes the manufacture of shopping bags, briefcases, saddles, bridles, suitcases and clothes.

Leather tradesmen work mainly indoors in workshops and factories. Depending on the specific trade, working conditions are not excessively noisy or dirty. However, preparing the hides of animals involves processes with chemicals that produce offensive odours, with the result that there is a tendency to locate tanning factories in isolated areas.

People with a tendency to allergies might encounter difficulties in the tanning industry because of the chemicals used. These factors, as well as the variety of sharp tools used, necessitate strict safety precautions.

Some fulfilling and satisfying aspects of this career
- working with your hands
- a variety of work tasks

- the opportunity to specialize
- the satisfaction of applying good workmanship to finish an article
- the chance to become self-employed

Some demanding and challenging aspects of this career
- offensive odours
- the health hazards resulting from the chemicals used
- standing all day

Purpose Orientation
A leather worker should:
- have technical aptitude;
- pay attention to detail;
- pride of workmanship;
- always work carefully and accurately to avoid waste;
- have manual dexterity;
- have steady and deft hands;
- have good eye-hand coordination.

School Subjects
Ordinary Level Certificate

Compulsory Subjects: None
Recommended Subjects: None

Training
In-service training takes place according to a syllabus prescribed by the employers in the tanning industry.

On successful completion of a trade test a recognition certificate is issued. Such trainees are supervised to ensure that they are trained properly and thoroughly.

Employer
- factories and workshops where leather and imitation leather goods are manufactured
- self-employment, as a cobbler or shoe repairer

Career 47: Locksmith

Locksmithing is the art of opening and closing locks without the use of the original key. A locksmith installs, repairs, changes and opens locks and combination locking mechanisms. They also make and duplicate keys.

Locksmithing is the art of opening and closing locks without the use of the original key. A locksmith installs, repairs, changes and opens locks and combination locking mechanisms. They also make keys and duplicate keys.

Locksmiths are best known for their skills in emergencies when customers are locked out of their cars, homes or offices. In such cases locksmiths are required to pick the locks. They may also be required to duplicate keys by means of the impression or key code. Combination locks are opened by touch or by the use of a drill. They repair damaged locks by replacing tumblers, springs and other parts.

The locksmith also recommends security measures such as periodical re-keying (changing the locking mechanism to fit new key codes) for businesses. Some locksmiths, known as protective signal repairers, install and repair burglar and fire alarm systems.

Most locksmiths work irregular hours because they are on 24-hour emergency call. They therefore need to have the necessary equipment with them at all times.

Some fulfilling and satisfying aspects of this career
- being of assistance to people who are locked out of their cars, etc.
- satisfying career and generally pleasant conditions

Some demanding and challenging aspects of this career
- irregular working hours, including evenings and weekends
- dealing with demanding people
- may not be rewarding financially, unless own business

Purpose Orientation
A locksmith should:
- be honest and dependable;
- be tactful;
- have good eye-hand coordination;
- have excellent eyesight;
- their work must be meticulous and accurate;

- have finger and manual dexterity;
- good powers of concentration.

School Subjects
Ordinary Level Certificate

Compulsory Subjects: None
Recommended Subjects: Engineering and Graphic Design, Mechanical Technology

Training
Apprenticeship training

Employer
- Locksmith shops
- Hardware and departmental stores
- Large industrial plants
- Safe and lock manufacturers
- Burglar and fire alarm companies
- A skilled and entrepreneurial locksmith can start up a business.

Career 48: Machine Worker

The machine worker is an operator who is responsible for supervising the operation of a machine, which is used to produce satisfactory finished articles according to specifications.

In the present era of mass production, the machine is playing an increasingly important role. Factories produce articles in their thousands - to provide for the growing needs of the community, and to ensure the economical manufacturing of such products.

The person responsible for the functioning of these manufacturing machines is the machine worker or machine operator. The machine is initially set up, so that it can produce the required article in terms of size, shape, finish and quantity. It is then set in motion by either the setter or the machine worker.

In the plastics industry, for example, an adequate supply of raw material is fed into the hopper to keep the manufacturing process in motion for the prescribed time. After the machine is set in motion, the machine worker monitors the machine to ensure that it is functioning satisfactorily, and to make any necessary adjustments to the machine. When something goes wrong, the supervisor is immediately summoned and in some cases the machine worker switches the machine off before calling for help.

In some factories, machines toss out the finished article (which is desirable for safety reasons), while others need a machine worker to remove the article. The machine worker must then inspect the article for flaws or irregularities in thickness, shape and colour and perform any trimming work that is needed, such as cutting off rough edges with a knife. The machine worker is also responsible for packing the product in stacks ready for despatch.

When machine workers in the plastics industry set their machines, it means that they must be able to measure accurately, insert the template into the machine correctly and also set the die and the speed of the machine.

Machine workers are also responsible for the cleaning of their machines. Although the work is performed in factories and workshops which are usually well lit and ventilated, the working conditions are rather unfavourable in that dust, oil and grease must be taken into account as part of the job. Considerable emphasis is placed on safety to prevent accidents on high-speed machines.

Some fulfilling and satisfying aspects of this career

- regular working hours

- working environment well-lit and ventilated

Some demanding and challenging aspects of this career
- work can be very repetitive
- work can be physically demanding
- working conditions may be unfavourable

Purpose Orientation
- reliability - machines and materials are very expensive and negligence could lead to great losses
- be able to tolerate repetition and produce the same standard of finished article each time
- need good vision to detect any faults
- be observant to immediately notice malfunctions
- manual dexterity
- good eye-hand co-ordination
- good health to be able to stand all day
- reading, writing and mathematical ability

School Subjects
No specific educational qualifications are required for appointment as machine workers. Many operators have an Ordinary Level Certificate or lower qualification. Some employers, however, give preference to persons with a higher educational qualification, especially when the degree of difficulty of the work is high.

Training
The training of operators is done on an informal basis on the job under supervision of experienced machine workers or on a more formal level by means of short internal courses, organized exclusively by the particular employers.

Employer
Any manufacturing organization such as
- iron and steel
- motor industry
- plastics industry.

Career 49: Measurement and Control Technician

Production processes depend to a large extent on instruments, which are the eyes and ears of the process industry. The main task of measurement and control technicians is to provide the link between the engineering and process teams in industry.

Measurement and control technicians are responsible for the installation, restoration, maintenance, adjustment and calibration of electrical, electronic, mechanical and hydraulic instruments, as well as the associated communication and data systems.

The technicians are also capable of designing and building electric and electronic circuits. The latest technology concerning instrumentation demands a thorough knowledge of computing technology and process control computers.

Apart from quickly becoming comfortable with the particular process, measurement and control technicians will also be called upon to apply other engineering skills and to control electrical and mechanical apparatus.

The application of safety regulations and first aid has to be second nature to measurement and control technicians.

Some fulfilling and satisfying aspects of this career
- working as a member of a team
- a variety of tasks

Some demanding and challenging aspects of this career
- need to pay attention at all times

Purpose Orientation
- have technical aptitude
- have an affinity for numbers
- attention to detail
- the ability to think logically
- be able to judge, lead and direct others
- to manage technical and administrative tasks
- be able to maintain balanced interpersonal relationships, as the work involves a great deal of teamwork.
- be healthy and fit

School Subjects
Ordinary Level Certificate

Compulsory Subjects: Mathematics and Physical Sciences
Recommended Subjects: None

Training
Courses in Engineering

Employer
The more experience technicians have and the better their qualifications are, the better job opportunities will become.
- oil refineries
- mining houses
- manufacturing plants
- railways
- water boards
- municipalities
- there are many opportunities for enterprising technicians to open their own businesses.

Career 50: Milliner (Hat Maker)

Milliners make hats for all kinds of people and for all types of occasions. They also remake hats and make adjustment to hats. If a theatrical producer was contemplating a production of, for example, Alice in Wonderland, a milliner may be asked to design headgear for most of the players and this would involve a certain amount of study, for only Alice and some of the lesser rabbits are bareheaded in the story.

Milliners design and make berets, bonnets, bridal headpieces, caps and hats using materials such as fabrics, felt, fur, leather, straw and artificial flowers.

Milliners interpret fashion trends and apply them to designs. When making hats, they mark out and cut patterns to the desired shape and size, lay the pattern onto fabric and cut around them using scissors for fabric hats. They shape, cut, twist, roll or fold and reinforce hoods with wire to gain the desired effect. They may assemble hats by hand or sewing machine and steam and press the material into shape by hand and, if necessary, stiffen it by using a special solution.

Hat brims may be reinforced with wire to maintain shape; headbands are sewn on and lining fixed into crowns. Trimmings such as ribbons, buckles, braids, feathers or chains may be added. Other milliner tasks may include altering, renovating and re-blocking existing hats; packaging hats for dispatch to customers; and displaying, fitting and selling hats and accessories.

In the mass production of hats, milliners may operate semi-automatic blocking machines. Milliners employed by mass-production firms usually perform single tasks, such as trimming hats with ribbon or sewing in headbands. Milliners making semi-model hats hand-trim shapes that have been moulded by machine. Highly skilled milliners create designs in fabric or on paper that can be followed by other milliners.

People from the beginning of time have worn hats of one kind or another - some for protection from the elements and some to enhance their beauty. Although hats are no longer a fashion necessity, they are still worn on special occasions and by people in the athletic and recreational fields.

Job opportunities depend on: the demand for hats; the cost, quality and durability of hats; fashion trends; and increasing awareness of the value of hats in preventing sun damage.

Some fulfilling and satisfying aspects of this career
- good fringe benefits if employees are Union members
- being paid for training on the job
- the possibility of starting your own business
- working creatively with one's hands

Some demanding and challenging aspects of this career
- doing routine work
- being closely supervised

- the constant emphasis on speed and accuracy
- sitting with little body movement for long periods of time
- noisy and possibly confined working space
- work dropping off with the demand for headgear declining

Purpose Orientation
- artistically inclined, creative and imaginative
- skilful and practical
- able to generate new ideas
- put ideas into sketches and practice
- sense of colour, line and fashion
- strong business sense
- good customer relations
- able to work with your hands to produce fine needlework
- patience and perseverance
- broad understanding of current fashion trends

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Visual Arts, Consumer Studies

Training
There is presently no formal training course in millinery, but candidates have several other options to consider. Private courses in Clothing Design can be completed at private fashion and design schools. Most of these courses consist of 1 year full-time study or 2 years part-time study.

Diploma in Fashion or Fashion Design & Technology

Employer
- hat manufacturing firms
- clothing factories
- fashion and costume designers
- small firms that produce semi-model hats by hand
- self-employment - with sufficient experience, the necessary capital and business ability, can set up own business, making and selling model (one-off) and semi-model hats

Career 51: Millwright

Millwrights or electromechanicians install and maintain heavy machinery used in industry. They perform maintenance work on production machines, electrically driven machines and electronic control gear.

The work is both mechanical and electrical. It involves dismantling, fault detection, repairing and in some cases, the manufacturing of parts, as well as the maintenance, reconstruction and installation of machinery.

With modern developments toward automation, this trade also requires knowledge of electronics as applied to the control of heavy electrically driven equipment. Millwrights should therefore have a thorough knowledge of the manufacturing of machine components.

Fault detection is one of the major responsibilities, as well as the installation of new machinery. In most cases the machine has to be dismantled before it is possible to determine where the fault lies. As it is often not possible to replace the defective component immediately, an electromechanician or millwright must be able to make temporary repairs, so that the machine can be used until the correct parts are available. This requires specialized knowledge of fitting. They must therefore have a thorough knowledge of the manufacturing of machined components.

Another important task of electromechanicians or millwrights is electrical installation. They dismantle electrical motors and test for faults, check wiring, as well as determine power output. This includes other functions such as the coupling of cables. Automation also requires skill in electronics as it is used in controlling heavy, electrically powered equipment.

Millwrights usually work indoors in the production sections of factories and industries. Work settings may range from modern and well-ventilated to hot, noisy and dirty, depending on the employer and the task. Some millwrights have to travel, especially those who work for construction companies, and therefore work in a variety of settings on site. Millwrights sometimes have to work long hours under difficult conditions and great tension to find and repair faults.

Some fulfilling and satisfying aspects of this career
- working with one's hands
- the variety of work
- working both with electric and mechanical components
- visiting different sites

Some demanding and challenging aspects of this career
- working in dirty, noisy environments
- long hours
- the possibility of accidents or injuries on the job

Purpose Orientation
A millwright should be/have:
- responsible, have initiative and self-confidence
- mechanical aptitude and understanding of electrical principles
- good memory for details
- manual dexterity and enjoy working with your hands
- healthy and strong
- good eye-hand coordination
- able to work under pressure and to solve problems
- able to work high above the ground and in confined spaces
- perseverance and the ambition to broaden knowledge

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: Mathematics
Recommended Subjects: Physical Sciences, Engineering and Technology

Training
Apprenticeship training.

Employer
- machinery manufacturers
- manufacturers of transportation equipment
- manufacturers of metal, paper, steel, and chemical products
- construction industry
- manufacturers and installers of electrical equipment
- government departments
- municipalities
- mines
- self-employment, with enough experience and capital, can start own business

Career 52: Moulder

Moulders cast molten metal into moulds to produce solidified castings.

They first prepare and shape the sand in which the mould is to be formed. They then prepare the core or inside of the casting by means of a core box and place the pattern into the moulding box. They pack sand firmly around the pattern to impress its form in the sand ensuring that moulding boxes cover the top faces. Heavy castings are formed by holes being dug in the ground and lined with sand or brickwork. The pattern is then removed and the mould dusted. Once the mould is dry, molten metal is poured through runners into the mould.

After the cast metal has cooled down, the mould is broken away and the edges of the solidified casting are smoothed before it is finally machined. Because moulds are exposed to very high temperatures and pressure during the moulding process the moulds must be of a high standard. Moulders work in foundries.

Some fulfilling and satisfying aspects of this career
- working with your hands
- working with others
- earning good wages
- satisfaction of seeing the results of your work

Some demanding and challenging aspects of this career
- the physical demands of the job
- working in dirty, hot and sometimes poorly ventilated settings
- the possibility of injury on the job
- working nightshifts or overtime and sometimes on public holidays and over weekends

Purpose Orientation
A moulder should:
- enjoy working with his hands;
- have a feeling for forms and structure;
- have an aptitude for Mathematics;
- be able to read three-dimensional drawings;
- be patient and practical;
- able to work accurately;
- have good health and stamina and average physical strength;
- have good coordination;
- have good eyesight.

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Mechanical Technology, Mathematics

Training
In-service training

Employer
- Automobile manufacturing industry
- Foundries
- Industrial plants
- Government undertakings
- Metal and related industries
- Mines
- Shipyards

Career 53: Musical Instrument Builder

Musical instrument builders not only build musical instruments, but also restore, repair, alter or adjust them, by using special techniques such as wood carving, silver smithing and cabinet making. They make and design instruments and their parts.

Musical instrument builders make and assemble instrument parts, tune instruments, attach strings and install electrical wiring for instruments. They also tell their clients, telling them more about the instrument and its acoustic properties.

Musical instrument builders need to know exactly what people are looking for. Most musical instrument builders specialize in one instrument, but some specialize in various instruments, usually from the same group, e.g.electronic, wind, string or brass.

Some fulfilling and satisfying aspects of this career
- the opportunity to specialize
- variety of work tasks
- the challenge of designing new instruments
- the possibility of becoming self-employed

Some demanding and demanding aspects of this career
- the possibility of eyestrain resulting from doing detailed work
- the possibility of accidents or injuries on the job
- working overtime to get orders completed

Purpose Orientation
A musical instrument builder must be/have:
- work meticulously
- very accurate and precise
- mathematical ability and mechanical aptitude
- diligent and patient
- good hand and finger dexterity
- practical
- love music and musical instruments

School Subjects
The minimum requirement is Ordinary Level Certificate

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Engineering and Graphic Design, Mechanical Technology, Electrical Technology

Training
Certificate in carpentry

Experienced musical instrument builders may provide in-service training

Employer
- instrument or music stores or factories
- self-employment, with enough experience and capital, can start own business or work on freelance basis, for example as a piano tuner

Career 54: Occupational Hygienist

Occupational hygienists are responsible for the health and well-being of workforces throughout all industrial manufacturing industries, such as mining, pharmaceuticals, airlines, chemicals etc.

They are trained to recognise health hazards and how to evaluate the extent of these hazards. They identify the risks involved and implement procedures for controlling them. These procedures assist management in coping with any risks to their workforce and prepare them for potential liabilities that might arise.

The typical duties of occupational hygienists are to carry out surveys on working conditions in the workplace, assess risks (such as chemical exposure, noise levels, poor lighting, ventilation etc, to document details of risk factors accurately, to give consideration to and recommend appropriate control methods, as well as to communicate effectively with the workforce and liaise with outside companies which specialise in health and safety services.

They work closely with the workforce, providing them with clear and accurate information regarding risk or health hazards. In order to do their work effectively, occupational hygienists need to stay well-informed on scientific and legal developments in the industrial manufacturing industry. Once they have gained the relevant experience, they may decide to become self-employed and work on a contractual or part-time basis.

Some fulfilling and satisfying aspects of this career
- satisfaction of knowing you are contributing to the health and safety of the workforce
- opportunity to become self-employed

Some demanding and challenging aspects of this career
- long hours spent consulting with workforces and health and safety specialists
- travelling between different sites and being away from home at times
- dealing with unhappy employees

Purpose Orientation
- able to communicate effectively
- responsible and ethical
- excellent people-skills
- high degree of attention to detail
- technical skills
- flair for and interest in research
- able to work with many different kinds of people
- safety and health conscious

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics
Recommended Subjects: Physical Sciences, Life Sciences

Training
Examples of places to study:

Degree: BSc, studying subjects such as Anatomy and Physiology, Environmental Planning, Community Development, Microbiology, Physics and Chemistry.

Employer
- large industrial manufacturers
- government departments
- health and safety organisations
- all industries or companies that employ a large workforce
- self-employment, with appropriate experience

Career 55: Paint Technologist/Technician

Paint technologists and technicians use their knowledge of the physical sciences, such as chemistry, physics and mathematics to address complicated industrial problems concerning paint and its use.

The work of paint technologists can be divided into three categories:

Analysis: these technologists, working in the analytical field, use their in-depth knowledge of the chemical and physical properties of the numerous colour pigments, solvents and binding agents available. They also need to be familiar with the equipment used in the manufacturing of paint. These technicians also have to be able to formulate and manufacture various synthetic resins that constitute the binder of paint.

Testing: these paint technologists test paints for various qualities. Before technicians can compose formulae for certain types of paint, they have to have comprehensive experience and background knowledge of the properties of the different elements that are used in the formula. Formulation forms an important part of a paint technologist's work and is closely related to finding and testing substitute elements, especially when the prices of the existing elements are rising or when certain elements become unavailable and have to be substituted.

Testing done by standards organizations, assures the public of the reliability and quality of the paint. A great variety of tests are carried out on paints, such as tests on the application, drying, resistance to water, and its ability to prevent decay and corrosion of the substrate.

Research: these technologists research existing products for improvements and develop new ones for the benefit of both consumers and the paint manufacturer. Since this is a specialized field, paint technicians with experience and knowledge of the subject, are the ones who move into research.

Some fulfilling and satisfying aspects of this career
- finding solutions to complicated problems concerning paint and the use of it
- variety of work and specialities
- good job opportunities

Some demanding and challenging aspects of this career
- working with chemicals that have strong smells
- keeping abreast of new developments

Purpose Orientation
A paint technologist should:
- have scientific and mathematical ability;
- be able to reason analytically;
- approach problems in a methodical way;
- be accurate;

- be able to work independently;
- have normal colour vision.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences

Training
Degree: An appropriate BSc degree, or BEng (Chemical) with Physics, Chemistry or Mathematics as major subjects. This degree takes 3 years to complete. Graduates with a BSc degree with Chemistry as a major subject or a BEng (Chemical Engineering) with Chemistry on third-year level, can improve their qualifications by doing the BSc(Hons)(Polymer Science).

Diploma in Polymer Technology

Employer
- Paint manufacturers
- Municipalities
- Motor manufacturers
- Self-employment, with enough experience, can start own business as a consultant or researcher

Career 56: Paper Technologist

Paper technologists are responsible for controlling the processes involved in the conversion of raw materials such as wood and bagasse (the dry refuse from sugar making) into pulp, paper, cardboard and related products, which are in turn converted to final products such as books, boxes, etc.

Paper technologists are involved in:

- the processes to manufacture pulp from raw materials
- supplying the chemicals for the various processes
- the design, manufacture and operation of the paper machines
- paper and board making
- converting and coating
- research and development
- project management.

Paper technologists apply their knowledge of chemical and mechanical engineering and paper factory technology to these processes to ensure high standards of quality in the final product.

In the basic pulping and paper-manufacturing process, paper technologists are responsible for various tasks described below:
Debarked logs of wood are converted into mechanical pulp, usually known as “ground wood”. To obtain chemical pulp, wood chips or bagasse are digested by means of a chemical solution and steam is used to remove the lignin, which cements the fibres together. The cellulose fibres that are obtained may be bleached in order to produce "white" paper, or used in its unbleached form to yield "brown" paper.

Wastepaper is another raw material with which paper technologists work. Before it can be re-used, impurities such as printing ink must be removed. This can be done by separating the fibres in a pulper, followed by an intensive cleaning and screening operation.

Paper technologists control the final finishing process in the manufacture of the paper. Depending on the use of the end product, surface sizing is then applied in a size press. Further finishing is done by passing the paper web through a calendar stack, in order to polish the surface, after which it is wound into a "Jumbo" reel of several tons.

The surface quality of the paper can be even further improved by applying a coating mix to the paper in a coating machine. The paper may then be super calendared to give it the required gloss.

Jumbo reels are rewound, slit and/or cut to the customers' requirements. Packed reels and reams are then dispatched to the customer.

Some fulfilling and satisfying aspects of this career
- challenging and interesting work
- being able to apply modern technology
- contributing towards the country's economy

Some demanding and challenging aspects of this career
- concentrating for long periods
- working with strong smelling chemicals
- working in noisy environments

Purpose Orientation
A paper technologist should:
- have a scientific and mechanical aptitude;
- interest in mechanics;
- able to reason analytically;
- be versatile;
- be practical.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences, Engineering and Technology

Training
Degree: BSc Wood Science

Diploma in Pulp and Paper Technology

Employer
- paper manufacturers
- packaging manufacturers
- self-employment, as a consultant or start own manufacturing business

Career 57: Piano Tuner

Piano tuners maintain and tune pianos by loosening or tightening strings with a tuning hammer, to achieve the correct pitch and balance. In order to obtain the correct touch, piano tuners need to adjust moving parts. They may also perform mechanical repairs and restoration work on pianos.

Piano tuners perform minor repairs such as replacing broken or worn strings, and also major repairs such as recovering keyboards, replacing wooden bridges and rearranging components. Piano tuners adjust the pedal action assembly on keyboards after testing and assessing pianos for restoration. A piano tuner may also repair barrel organs and service accordions.

Before a piano tuner can perform the actual tuning, it is necessary to determine whether the instrument needs any mechanical repair:

- the felt-cover hammers can wear out or reproduce bad sound quality, they need to be replaced or scoured off
- the tuning pins to which the strings are attached sometimes have to be replaced with a thicker set of pins
- piano keys need to be bleached or treated to regain the original colour
- when one of the steel strings breaks, it has to be replaced.

After the piano is cleaned and repaired, the actual tuning can start. Tuning-forks, hammers and felt wedges, which are pressed between the strings, are used. When piano keys are struck, felt-covered hammers strike steel strings in the piano, which cause the strings to vibrate. The number of times that the string vibrates per second is called the pitch.

Piano tuners adjust piano strings to the proper pitch by using tuning forks. A steel pin is turned to tighten or loosen the string until its pitch matches that of the tuning fork. First the pitch of the 'A' string is adjusted and then the pitch of each of the other strings is adjusted in relation to the 'A' string.

A piano is a very complex instrument. It contains about two hundred and thirty strings, eighty-eight keys and more than four thousand working parts, depending on the size and model.

There are two types of pianos - the upright piano and the grand piano. The largest concert-type grand piano has the longest string, which is about two hundred centimetres long, while the shortest is approximately five centimetres long. Strings are tightly stretched and exert a pull of more than ten thousand kilograms in the frame to which they are attached.

Some fulfilling and satisfying aspects of this career
- pride in fixing a valuable musical instrument
- working in the music field
- the possibility of being self-employed

Some demanding and challenging aspects of this career
- physically tiring work, (sitting, bending, standing)
- concentrating for long periods
- financially trying when work is not abundant

Purpose Orientation
A piano tuner should:
- have good musical ability and tonal discrimination;
- have good hearing;
- be able to concentrate while tuning the piano;
- have patience and determination;
- have finger and manual dexterity;
- present a neat, well-groomed appearance.

School Subjects
Ordinary Level Certificate.
Advanced Level Certificate is preferable.

Compulsory Subjects: None
Recommended Subjects: Music

Training
An experienced piano tuner may provide in-service training.

Employer
- Piano repair shops
- Music dealers
- Piano manufacturers
- Provincial administrations
- Self-employment, with the necessary experience, can start his own business.

Career 58: Plastic Technologist/Polymer Scientist

Plastics technologists or polymer scientists perform highly skilled work in the plastics industry, which is linked to the chemical industry. The raw materials used in the manufacture of plastics are mainly coal and by-products of coal. Various techniques and processes are used to produce the different types of plastics known.

Plastics technologists test the processes used to produce plastics, and put processes into operation. They oversee these processes and the production of plastics. They test the quality of plastics and the final consumer product. They are also involved in locating and correcting factory faults.

Plastics technologists are not only responsible for the development and testing of plastic products, but may also participate in the marketing, production, sales, services and management activities.

Some fulfilling and satisfying aspects of this career
- the opportunity to be original in one's work
- working with your hands
- creating a finished product

Some demanding and challenging aspects of this career
- the dirt and noise of one's surroundings
- the mess of working with glue
- the potential danger of resin particles floating about

Purpose Orientation
A plastics technologist should:
- have a flair for management, production and quality control;
- be observant and inquisitive;
- have patience and perseverance;
- be a responsible worker;
- have an interest in chemistry;
- have manual dexterity;
- be technically inclined.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Engineering and Technology

Training
Degree: BSc Eng or BSc - with suitable majors, such as Chemistry. Chemistry and Polymer Science

Diploma in Polymer Technology. This course takes 3 years to complete and consists of 3 semesters' full-time theoretical training and 3 semesters' in-service training.

Post-graduate training: BSc (Hons) degree in Polymer Science for BSc graduates with Chemistry as a major subject.

Employer
- Plastics manufacturing companies
- Plants that process raw materials for plastic.

Career 59: Plastic Worker/Operator

A vast number of objects today are made of plastic. Plastics workers / operators manufacture these articles out of plastic, mixed with resin bonding.

A basic structure is built first, onto which a release agent is spread. Then gel is applied, followed by layers of plastic and resin bonding until the required thickness is obtained. Before the resin sets it has to be sanded on the uneven side with a sander until smooth. After the resin product has been removed from the ground structure the product is completed by mounting the rest of the required parts in or on the resin.

Plastics workers have to set up and maintain the machines that transform plastic compounds into a wide variety of consumer products.

Some fulfilling and satisfying aspects of this career
- the opportunity to be original in one's work
- working with your hands
- creating finished products

Some demanding and challenging aspects of this career
- the dirt and noise of one's surroundings
- the mess of working with glue
- the potential danger of resin particles floating about

Purpose Orientation
A plastics worker should:
- be patient and precise;
- be able to work alone;
- have manual dexterity;
- have three-dimensional visualisation;
- have mathematical aptitude;
- be physically healthy and fit.

School Subjects
No specific requirements.
Some employers prefer an Ordinary Level Certificate or Advanced Level Certificate.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Physical Sciences

Training
In-service training takes place over a period of three to six months under the close supervision of a qualified plastics worker.

Employer
- Plants and industries that manufacture plastic consumer products

Career 60: Printer’s Cutter

Before the actual printing of books, newspapers, periodicals and other printed matter takes place, the paper must be prepared and submitted in the appropriate form and size, in each case.

Printer's cutters measure and cut paper according to specified dimensions. Power-driven guillotines are operated to perform this. The paper is then arranged in batches and prepared for the subsequent printing operation.

Printer's cutters must be well acquainted with receiving and dispatching procedures.

Some fulfilling and satisfying aspects of this career
- working with your hands
- satisfaction of producing evenly cut paper
- working in a relatively clean setting

Some demanding and challenging aspects of this career
- possible boredom from repetitive tasks
- standing or walking most of the day
- noise from machines

Purpose Orientation
A printer's cutter should:
- be neat;
- work very accurately;
- be alert and careful;
- show a sense of responsibility;
- have a certain amount of mechanical insight;
- be able to work in a team.

Printers' warehousing (including cutting) workers need:
-manual dexterity
-good eye-hand coordination
-good vision
-stamina and strength.

School Subjects
Ordinary Level Certificate for a learnership at a company

Compulsory Subjects: None
Recommended Subjects: Mathematics

Training
If you want to become a printer's cutter you need to register with an employer providing suitable training. Training consists of theoretical and practical work.

Employer
- Commercial printing plants
- Book and magazine publishers
- Newspaper plants
- Stationery and envelop manufacturers
- Government departments
- Government Printing Works
- Manufacturers and other firms that do their own printing

Career 61: Printer’s Mechanic

Printer's mechanics are responsible for the installation and maintenance of printing machines and other equipment in printing companies. Due to technological advances this work has become very specialized and an important part of the industry.

Printer's mechanics mount, install, maintain, repair, move and rearrange a wide variety of machines and equipment. These mechanics assemble, install and test new machines, or parts of machines to integrate their operation with existing machines.

Printer's mechanics have to complete their work quickly and efficiently, because downtime on a printing machine can lead to huge production losses. It is also necessary for these mechanics to be extremely cautious because negligence can lead to injuries.

Some fulfilling and satisfying aspects of this career
- working with your hands
- challenge of getting machines to work first time
- good wages and benefits

Some demanding and challenging aspects of this career
- possibility of injury on the job
- working in noisy environments
- lifting heavy machinery
- sometimes having to work overtime

Purpose Orientation
A printer's mechanic should:
- be accurate and alert;
- have mathematical aptitude;
- have mechanical inclination;
- enjoy working with his hands;
- be practical;
- be responsible;
- have good work habits.

School Subjects
Ordinary Level Certificate for a learnership at a company

Compulsory Subjects: None

Recommended Subjects: Mathematics, Engineering and Graphic Design, Mechanical Technology

Training

Theoretical and Practical training. Theory at various private Colleges and practice as part of in-service training by employer.

Employer

- Commercial printing plants
- Book and magazine publishers
- Newspaper plants
- Stationery and envelope manufacturers
- Government departments e.g. Government Printing Works
- Manufacturers and other firms that do their own printing

Career 62: Process Engraver

Process engravers prepare all types of illustrations that cannot be typeset. They operate process cameras and produces negatives of photographs and other artwork.

These negatives are developed to make light impressions (exposures) on metal plates that are highly sensitive to light. Sections of the plates that have been exposed to light become resistant to acid. When the plate is immersed in a nitric acid bath, the acid etches away the unexposed sections of the plate and reveals the sections in full relief. As soon as a print is ready, it is ruled according to size and mounted on wood. The blocks are then mounted and composed in page form.

Process engravers usually work indoors in rooms in which the cameras are kept. They also work in specials room in which light is used to transpose the impression of the negative on to the metal plates. Another room is used for lining, mounting and finishing off the product.

Some fulfilling and satisfying aspects of this career
- working with one's hands
- the satisfaction one derives from seeing one's finished product
- working with people
- being part of the hustle and bustle of the printing industry

Some demanding and challenging aspects of this career
- a lot of standing and walking
- having to work accurately under time pressures
- limited job opportunities

Purpose Orientation
A process engraver should:
- have manual dexterity;
- have good eye-hand coordination;
- have good vision;
- be able to discriminate between colour;
- have artistic inclination;
- be a precise and accurate worker.

School Subjects
Ordinary Level Certificate for an learnership at a company

Compulsory Subjects: None
Recommended Subjects: Visual Arts, Physical Sciences, Mathematics

Training
In-service training

Employer
- Commercial printing plants
- Book and magazine publishers
- Newspaper plants
- Stationery and envelope manufacturers
- Government departments
- Manufacturers and other firms that do their own printing
- Self-employment, with enough experience and capital, can start own business

Career 63: Pulp and Paper Industry Careers

Paper and pulp manufacturing is a growing and dynamic industry in South Africa and requires a wide variety of personnel - from unskilled and semi-skilled workers to tradesmen, technicians and engineers - to control all the processes and develop new ones.

Production: The paper industry is highly mechanized. Various specialized machines are used in the production process to manufacture paper, pulp and other finished paper products. An adaptor controls each machine. Examples of the different operators necessary to control these machines are the barker operator, digester operator, stock preparation operator, paper machine operator and envelope machine operator.

Maintenance: The paper industry employs many skilled maintenance workers to care for the complex machinery and electrical equipment. Millwrights install and repair machinery. Instrument repairers service the instruments, which measure and control the flow of pulp, paper, water, steam and chemical additives. Other important maintenance employees include electricians, maintenance machinists and pipe fitters.

Professional and Technical Occupations: The complexity of pulp and paper manufacturing requires workers who have engineering, chemical or other technical training. Chemists are responsible for quality control and they study the influence of various chemicals on pulp and paper. Chemical and mechanical engineers develop new production methods. Electrical engineers supervise the operation of power-generating equipment and instruments. Packaging designers design containers and packages and supervise their production. Box manufactures sometimes employ artist to design lettering, more computerized, system analysts and computer programmers become more important. Laboratory technicians, pulp testers and chemical analysts are necessary to assist engineers and chemists in their research.

The pulp and paper industry also employs many administrative and clerical personnel.

Requirements
- technical ability
- precise worker

School Subjects
No specific requirements
- Ordinary Level Certificate or higher recommended.
- Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: depends on what degree is to be undertaken, else none
Recommended Subjects: Physical Sciences, Mathematics, Engiineering and Technology

Training
Degree: BSc Wood Science

Diploma in Pulp and Paper Technology

Most paper and pulp companies offer in-service training. For the more specialized occupations such as engineers and chemical analysts, applicants must be in possession of a relevant university of technology or university qualification before appointment.

Employer
Companies in the paper and pulp industry

Career 64: Quality Control Inspector

Quality control inspectors, or quality controllers as they are also known, are employed by various manufacturers and are responsible for checking items, such as motor vehicles, at various stages of production to ensure that quality standards are being maintained.

The work of quality controllers can be divided into two different fields:

Receiving quality controller: Motor manufacturers, for example, do not produce all the components installed in a motor vehicle; some are bought from other manufacturers. This person checks the quality of parts which have been bought in from other manufacturers and verifies receipt thereof by checking them against documentation. Examples of these are tyres, window panels, carpets and so forth. Articles, which are delivered by other manufacturers, must conform to prescribed standards and must be in perfect working condition. Items which may be damaged during transport, must usually be checked for scratch marks, cracks and dents.

Some articles, such as alternators, for example, require thorough testing. This testing takes place through the utilisation of the necessary electronic or other equipment. It is an impossible task to subject all of the items to this type of testing and it can therefore be decided, for example, that a sample of fifty or a hundred of the articles of a consignment, be thoroughly tested.

Apart from the fact that the quality must be checked, the inspector must also ensure that the items which are indicated on the consignment note, are all delivered. If the receipt of articles, which in reality have not been sent, is acknowledged, the firm may later be debited for them, that is, the firm will have to pay for articles which were actually never received.

Production quality controller: These inspectors work inside the factories and will be found at different points in the manufacturing process. They check the quality of each item on the factory production line against a checklist, ensuring that items not up to standard do not proceed to the next phase of production or assembly.

They must ensure that none of the components are overlooked, no matter how slight the mistake may be. If it appears that something is faulty in any way, the fault must first be corrected before the following phase in the manufacturing process may take place. These inspectors are provided with lists of the items, which they need to examine. They mark off each item inspected.

Each manufactured item is subjected to very strict examination during this last stage. The digital dynamometer, for example, measures the speed and amount of power which the engine delivers, and the necessary adjustments are made.

If inspectors find faults in any of the manufacturing phases, then those faults have to be corrected or the missing components have to be provided. Some faults, such as dents in the bodywork of a motor vehicle, are mechanically repaired.

Some fulfilling and satisfying aspects of this career
- ensuring that important items, such as vehicles, are reliable, roadworthy and safe
- different industries to choose from, such as pharmaceutical and vehicle production
- not office bound
- variety of tasks to perform

Some demanding and challenging aspects of this career
- some routine work can be monotonous
- being on your feet for long periods
- dealing with difficult people
- working under pressure
- sometimes having to work overtime, such as over weekends to get jobs done

Purpose Orientation
A quality control inspector should:
- have good eyesight and colour discrimination;
- have keen observation skills;
- have good form perception and mechanical insight;
- have a meticulous nature;
- be assertive;
- be firm;
- maintain good interpersonal relationships;
- have sound physical health.

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Physical Sciences, Engineering and Graphic Design, Mechanical Technology

Training
Diploma: Generally companies promote well-experienced assembly line workers who have

demonstrated good quality attributes and skills. Formal training generally consists of ISO 9000 training and quality audit training.

Diploma in Production Management

The necessary skills are usually acquired on the job, working with experienced quality control inspectors.

Employer
- motor industry
- pharmaceutical manufacturers
- all factories with production lines, where quality is essential
- food producers
- self-employment, with enough experience and capital, can start own manufacturing concern

Career 65: Refrigerator Mechanic

Industrial refrigeration mechanics install, repair and maintain the air-conditioning and refrigeration equipment used in a wide range of applications. This involves reading and understanding mechanical, electrical and architectural drawings and the use of hand and workshop tools, brazing and soldering equipment and measuring instruments.

Refrigeration mechanics install units, make the necessary electrical connections and also undertake the maintenance and repair of the units. A good knowledge of electrical principles is essential as these mechanics must be able to trace a fault and make repairs and adjustments, which may be electrical or mechanical.

Some fulfilling and satisfying aspects of this career
- non-routine nature of the work
- challenge each job presents
- varied employment possibilities
- good remuneration

Some demanding and challenging aspects of this career
- some element of danger in the work
- dirty working conditions sometimes prevail
- having to work shifts or overtime or be away from home for periods of time

Purpose Orientation
A refrigeration mechanic should:
- have mechanical aptitude;
- be able to think logically;
- enjoy working with his hands;
- be able to liaise well with clients;
- have mathematical aptitude;
- be able to pay attention to detail;
- be interested in problem-solving;
- be accurate and work carefully;
- be able to work without direct supervision.

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Engineering and Graphic Design, Physical Sciences, Mechanical Technology

Training
Apprenticeship training

Employer
- Air conditioning and refrigeration contracting companies
- Wholesalers and manufacturers
- Large industrial plants
- Public service sections
- Carbonated soft-drink Industry
- Self-employment, with enough experience and capital, can start own business

Career 66: Rotary Machine Minder

Rotary machine minders fasten cylindrical surfaces, which do printing, into fixed positions, then set the rotary machine in motion.

Rotary machine minders ensure that stereotypes or lithographic metal plates fit properly and make contact with the paper evenly. They place huge paper rolls into the rotary machine, then set the ink rollers and fill the ink holders. They make proofs to ensure that all letters and images print properly onto the paper. They examine the proofs and adjust the machine and the ink until the printing is done properly and evenly. They also test the colour and ink quantities.

Rotary machine minders check their machines at regular intervals throughout the printing process to ensure accuracy and quality of printing.

Some fulfilling and satisfying aspects of this career
- working with your hands
- satisfaction of producing even print
- working in a relatively clean setting

Some demanding and challenging aspects of this career
- possible boredom from routine tasks
- standing or walking most of the day
- noise from the machines

Purpose Orientation
A rotary machine-minder should:
- be physically healthy and relatively strong;
- not be colour-blind;
- have finger and hand dexterity;
- work quickly, accurately and safely;
- have good eye-sight;
- have good eye-hand coordination;
- show a sense of responsibility;
- have a certain amount of mechanical insight.

School Subjects
Ordinary Level Certificate for a learnership at a company

Compulsory Subjects: Mathematics

Recommended Subjects: Physical Sciences, Mechanical Technology

Training
Apprenticeship training

Employer
- Commercial printing plants
- Book and magazine publishers
- Newspaper plants
- Stationery and envelope manufacturers
- Government departments
- Government Printing Works
- Manufacturers and other firms that do their own printing

Career 67: Rubber Technologist

Rubber technologists apply their knowledge of physics, chemistry and engineering to the process of converting raw rubber material into saleable products such as tyres, belting, elastic bands, balloons, balls and footwear.

Rubber technologists usually specialize in one of the following areas of the rubber industry:

Product and production control: this entails drawing up standard formulae for the production of rubber products based on laboratory experimentation.

Product development: these rubber technologists are involved in the design of new rubber products. Planning is done in cooperation with engineers, draughtsmen and consumers in the mining, chemical and automotive industry. A prototype is made and tested to ensure that it complies with the requirements.

Quality control: controlling the rubber manufacturing process and ensuring that quality standards are maintained throughout.

Sales: these rubber technologists give technical advice to customers and may be involved in work studies, technical writing, purchasing, market research, training and sales of rubber products.

Some fulfilling and satisfying aspects of this career
- challenging and interesting work
- variety of specialities to choose from
- being able to apply modern technology
- contributing towards the country's economy

Some demanding and challenging aspects of this career
- requires lots of concentration
- research work can be frustrating at times
- keeping abreast of developments in this field

Purpose Orientation
A rubber technologist should:
- have an analytical mind;
- be able to solve problems logically;
- be adaptable;

- master both chemical and engineering problems;
- be interested in physics and chemistry.

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Information Technology, Engineering and Graphic Design

Training
Diploma in Rubber Technology

Employer
- Manufacturers of rubber products
- Organizations in the rubber industry
- Automotive industry

Career 68: Safety Manager/Officer

The primary aim of safety managers or officers is to create a work environment that is safe for employees to work in.

They are required to develop and maintain accident prevention programmes and are responsible for ensuring that occupational accidents do not occur in the work place. To achieve this, they need to keep careful records of accidents that do occur, investigate the causes of these accidents and implement measures to prevent such accidents from recurring.

Safety managers will perform a number of tasks, including ad hoc safety inspections, maintaining accident occurrence records (as required by law), testifying in hearings and in court, and training other safety officers.

They are predominantly employed in manufacturing or production plants, as it is within such environments that heavy-duty machinery - the major cause of industrial accidents - is used. The work environment is usually noisy. Most safety officers work from an office. Due to the diversity of industries in which they are employed, they may be required to work outdoors, for instance in the construction industry.

Safety engineers work to develop more efficient and safe manufacturing processes and safety measures - see Industrial Engineer for more details.

Occupational health and safety officers coordinate health and safety systems in an organization, identify hazards and assess risks to health and safety, put appropriate safety controls in place, and provide advice on accident prevention and occupational health to management and employees.

Occupational / Industrial hygienists identify and investigate problems of occupational / industrial hygiene (chemical and biological hazards) in the workplace. They use scientific equipment to measure and control hazardous substances.

Some fulfilling and satisfying aspects of this career
- ensuring the safety of the public and employees
- visiting various companies prevents boredom
- working both indoors and outdoors

Some demanding and challenging aspects of this career
- some working environments are very noisy for example mines, airlines, etc.

- working with uncooperative people
- travelling can become tiring

Purpose Orientation
- analytically minded
- strong clerical ability
- dogmatic, but with a high degree of empathy
- practically minded
- physically fit
- strong interpersonal skills

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Accounting

Training
B Tech and Diploma in Safety Management and Security Management

Employer
- large construction companies
- mines
- saw-mills
- food manufacturers
- airlines
- motor industries

Career 69: Sail maker and Upholsterer

A sail maker and upholsterer uses canvas and PVC sheets to make or repair a variety of articles like tool bags, blinds, camping beds, tents, army webbing, sails, tarpaulins, garden chairs and sun visors.

The sail maker and upholsterer:
- cuts canvas and PVC sheets according to the patterns and stacks them;
- stitches the various pieces together by hand or machine;
- adds the necessary accessories like PVC windows, eyelets, ropes, zips, press studs and buckles for fastening;
- manufactures or repairs large items like tents, sails and tarpaulins;
- cuts and stitches material lining or stiffening into certain articles.

When articles are made with PVC sheeting only, modern apparatus is used to fuse the seams together.

Some fulfilling and satisfying aspects of this career
- making things which enhance the comfort of people
- working in a team
- working with one's hands
- job security for semi-skilled workers

Some demanding and challenging aspects of this career
- limited job opportunities
- limited prospects for promotion
- working under supervision
- the tiring physical work involved

Purpose Orientation
A sail maker and upholsterer should:
- be willing to work hard;
- be creative and like making things;
- enjoy routine tasks;
- work in a team;
- have good eye-hand coordination;
- have manual dexterity to work with sewing machines;
- be healthy and strong to work with heavy machinery, canvas or PVC.

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None
Recommended Subjects: Consumer Studies

Training
In-Service Training:
At sail factories a worker can receive in-service training.

Learnership Training:
If you want to become a sail maker and upholsterer you need to register with an employer. All costs of successful training are borne by the employer.

Employer
- Canvas manufacturers
- Shipyards
- Navy
- Prisons Service
- Self-employed

Career 70: Scale Fitter

Scale fitters install, repair and calibrate a variety of scales.

They repair and recondition the various working parts of lever systems and fit replacement parts. They assemble, set up, test and adjust the various types of beam, counter and platform scales. They unpack, erect, set up and adjust self-indicating and partially self-indicating scales. They erect, maintain and recondition road and rail mass bridges. They may in some instances manufacture parts of scales that cannot be repaired or replaced.

The measuring of weights, whether of foodstuffs or any other product that is sold according to weight, must be accurate. The authorities act strictly against those who do not abide by the regulations. Scale fitters must see to it that the regulations are not violated.

Some fulfilling and satisfying aspects of this career
- working in clean pleasant workshops
- regular working hours
- challenge of working with fine intricate machines
- good employment possibilities
- mostly good salaries paid

Some demanding and challenging aspects of this career
- high standard of training that demands accuracy
- keeping up absolute standards
- in some cases, a lot of travelling

Purpose Orientation
A scale fitter should:
- enjoy precision work;
- work very accurately;
- be dependable;
- have mechanical insight and ability;
- have sound knowledge of mathematics and physics;
- work with intricate mechanisms;
- have good eye-hand coordination;
- have good eyesight.

School Subjects
Ordinary Level Certificate.

Some employers prefer higher qualifications.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Mechanical Technology

Training
Training is offered at various scale companies.

After completion of the learnership course, the scale fitter will be knowledgeable about Safety, Workshop Drawing, Welding and Soldering, Rigging, Fitting and Electronics.

Employer
- Companies that manufacture and install scales and mass measuring instruments
- General trade where equipment in use is repaired and inspected
- Self-employed (specialised servicing and maintenance)

Career 71: Scientific Glass Blower

The scientific glass blower manufactures glass instruments and apparatus. These are used both in laboratories and in fieldwork by scientists and engineers in their research, development and tutorial duties. Scientific glass blowers also work in industry, particularly in the pharmaceutical and chemical industries.

Scientific glass blowers are often required to assist in the design of prototype equipment and thus play a major role in the success or failure of a project. The work entails the shaping and forming of a variety of types and shapes of glass according to the specifications given. The glass can be machined, ground, drilled, blown, bent, fused (welded), twisted, drawn and parted.

Some fulfilling and satisfying aspects of this career
- creating needed items
- seeing the finished product
- working with your hands

Some demanding and challenging aspects of this career
- concentration needed for long periods, due to potential dangers
- possible eyestrain and physical exhaustion

Purpose Orientation
A scientific glass blower should:
- enjoy creating things with his hands;
- be able to visualise objects in three dimensions;
- be observant and patient;
- enjoy working with delicate materials;
- be well-disciplined in the use of safety equipment;
- be able to work independently;
- have artistic inclination.

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Physical Sciences, Mechanical Technology

Training

Apprenticeship training

Employer
- Research institutions
- Universities
- Pharmaceutical and chemical industries
- Self-employment, doing freelance work

Career 72: Sowing Machine Mechanic

Sewing machine mechanics service, maintain and repair sewing machines in clothing factories. This role serves as a very important link in the production chain, as the factory cannot function at optimum production whilst a machine is out of order.

Some of the tasks that the sewing machine mechanic has to perform include:

- adjusting machine parts
- regulating the length and stroke of the needle
- setting the timing
- dismantling machines and replacing worn or broken parts
- inspecting shafts and belts and repairing broken transmission belts and motors
- installing new specified parts on machines.

Some fulfilling and satisfying aspects of this career
- working with your hands
- good job opportunities
- being able to get training and work with little formal education

Some demanding and challenging aspects of this career
- working in noisy factories
- working under pressure
- routine tasks

Purpose Orientation
A sewing machine mechanic should:
- have technical and mechanical aptitude;
- be able to work efficiently with his hands;
- be responsible;
- be able to make decisions;
- work in a team as well as independently.

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Mechanical Technology, Electrical Technology, Engineering and

Graphic Design

Training
Diploma in Sewing-Machine Mechanics and Maintenance.

Employer
- Clothing factories
- Machine manufacturers
- Large boutiques
- Self-employment, with enough experience can work on a contract basis

Employment prospects in this line of work are good. The clothing industry constantly requires more qualified mechanics than are available.

Career 73: Sowing Machine Operator

Sewing machine operators use high-powered, heavy-duty industrial sewing machines to stitch together garments and other products of cloth, canvas, leather and non-woven fabrics.

They may construct the entire finished product or specialize in performing a single operation such as sewing seams or stitching collars. They need to handle machines with care and report any defect to the sewing machine mechanic or the manager. They usually work in clothing factories on a production line.

With experience, sewing machine operators may progress from performing simple operations like stitching straight seams to more complex tasks like finishing sleeves. They may use elementary machines, multiple-needle machines with special attachments and work aids and other automatic equipment.

Some areas of specialization include:

- single-needle operator
- double-needle operator
- blind stitch operator
- bar tack operator
- sewing on buttons and making button holes
- fancy stitching

As the sewing machine operator progresses in the work, wages may increase accordingly. Bonus schemes often provide incentives to work as quickly as possible.

Some fulfilling and satisfying aspects of this career
- good fringe benefits if employees are Union members
- being paid for training on the job
- steady employment
- working with one's hands

Some demanding and challenging aspects of this career
- doing routine work
- being closely supervised
- the constant emphasis on speed and accuracy
- sitting with little body movement for long periods of time
- noise in sewing room

- working in a confined space

Purpose Orientation
A sewing machine operator should:
- be able to concentrate;
- have an aptitude for needlework;
- have a certain amount of mechanical insight;
- work quickly and carefully;
- be quality-conscious;
- enjoy routine work tasks;
- be able to sit and work for long periods;
- be able to work under pressure.

School Subjects
Ordinary Level Certificate for in-service training.
Advanced Level Certificate or higher qualification for training at a technical college or fashion house

Preference is given to people with an Advanced Level Certificate.

Compulsory Subjects: None
Recommended Subjects: Consumer Studies

Training
Many factories have their own centres which offer training, where operators are taught how to perform each task with minimal finger, arm and body movement.

Employer
- Garment manufacturing factories
- Curtain and drapery companies
- Accessory manufacturers
- Furniture manufacturers
- Self-employment, with enough experience, initiative and capital, can start own business

Career 74: Sheet Metal Worker

Sheet metal workers manufacture various types of articles and components out of sheet metal less than three millimetres thick.

They make and install sheet metal ducts for air-conditioning, heating and ventilation systems. They make and install metal for kitchen walls and counters and stamped metal for roofing and siding. They install roof gutters and downpipes for rainwater drainage and make skylights and vents for industrial buildings.

Sheet metal workers manufacture most metal components in workshops where the metal pieces to be used are measured, cut, bent, shaped and joined. After the metal has been cut the seams and joints are cemented, bolted, riveted, soldered or welded together to form ducts, pipes, tubes and other items.

In the final stage, the excess soldering or welding is removed and the article cleaned. Sometimes a product has to be treated against rust by galvanising, tin-plating or treating with certain chemicals.

Some fulfilling and satisfying aspects of this career
- regular working hours
- extra pay for overtime
- working with your hands
- usually good remuneration
- steady work

Some demanding and challenging aspects of this career
- possibility of injury on the job
- physically tiring with much bending, lifting and standing
- working outdoors on construction sites in adverse weather conditions

Purpose Orientation
A sheet metal worker should:
- be deft with his hands and have manual dexterity;
- be a precision worker;
- be interested in mechanical work;
- work alone as well as being part of a team;
- have good health and physical stamina;
- have mechanical aptitude;

- have good eye-hand coordination.

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Physical Sciences, Civil Technology, Mechanical Technology

Training
The duration of the learnership is 2 to 4 years. Prospective sheet metal workers can do their learnership at any organization in the aerospace industry, metal and mining industries. Theoretical training is given at a technical college. Learners must pass an approved trade test to qualify as tradespersons. Practical in-service training is given in the work situation, under the supervision of qualified tradespersons.

Employer
- Aerospace industry
- Transnet
- Metal industry
- Mining industry
- Engineering industries
- Contractors specialising in heating, refrigerating, air-conditioning and air pollution equipment
- Commercial building industry

Career 75: Solar Power Engineer

Solar power engineers focus on converting natural energy into practical uses by studying the motion of gases, liquids and solids, and the effect that heating and cooling have on these substances. This is a very important career in this time of acute energy shortages.

Solar power engineers design solar energy cells by using scientific information gathered from the combustion of matter, interaction of materials and transfer of energy. Solar energy cells collect the sun's rays, thereby harnessing natural energy. This energy supplies power which can be used in many different environments, such as providing power for large-scale solar power electrical generation stations or much smaller solar power panels for domestic use. Solar panels are also used in the heating of water for swimming pools and buildings.

Due to the need for cheaper power supply solutions, solar power engineers continually experiment with different and more economical ways of collecting and distributing this natural, unlimited and above all, free energy supply.

They may spend most of their time doing research, as well as designing, developing and testing their projects. They are required to produce detailed reports on the research they conduct. Solar power engineers work closely with other engineers on complex projects, each working on a different aspect of the project.

They work mostly in laboratories, research or manufacturing facilities. They work with computers, testing equipment, solar cells, solar panels, research materials and reports.

Some fulfilling and satisfying aspects of this career
- interesting and challenging careers
- satisfaction using natural energy and thus protecting the environment

Some demanding and challenging aspects of this career
- long hours spent doing research
- stressful when working to deadlines
- lack of funding for research projects

Purpose Orientation
- mathematical and technical ability
- able to communicate effectively
- have information gathering skills
- enjoy doing research

- prepared to work alone or part of a team

School Subjects
Ordinary Level Certificate meeting requirements for course

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Engineering and Technology

Training
Degree: BEng Electrical or Mechanical Engineering

Employer
- electrical equipment manufacturing companies
- research and development institutes, laboratories
- industrial laboratories
- government departments
- electrical power supply companies
- solar energy companies

Career 76: Stained Glass Artist

Stained glass artists create designs for art objects made of glass, such as windows, bottles, bulbs, dishes and lampshades. They use both plate and window glass and scraps of safety glass from such items as windshields.

Stained glass artists study the shape of the window and integrate practical requirements with their knowledge of symbolic images and glass cutting. They make a full size working pattern and select and cut the glass according to the designed pattern. This can only occur once the cost has been estimated. The stained glass artist then assembles all the pieces and secures them in place. The glass is then stained or painted and fired in order to stabilize the colours. The stained glass artist then installs the completed window.

Some fulfilling and satisfying aspects of this career
- making beautiful objects
- working artistically with your hands
- learning and finding new techniques
- utilising your talent and pleasing others
- being creative
- the possibility of becoming famous or at least respected and well-known

Some demanding and challenging aspects of this career
- having to earn money in other jobs, thus not spending as time as one would like on one's own artistic projects
- frustration with not achieving what one had envisaged
- having to do work that might satisfy a client but not necessarily your creative instincts
- hard work
- struggling financially, especially if working on your own

Purpose Orientation
- artistic and imaginative
- creative, but practically inclined
- patient, persevering, self-disciplined and self-motivated
- perceptive and ability to transform perceptions into a work of art
- good sense of form, design and colour
- dedicated to this artistic form of craft
- able to handle frustration, criticism and rejection
- willing to work hard
- manual dexterity and eye-hand coordination

- good knowledge of religious and other symbols
- able to visualize objects three-dimensionally

School Subjects
Ordinary Level Certificate
Advanced Level Certificate meeting degree requirements for a diploma or degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Visual Arts for degree course
Recommended Subjects: Mechanical Technology

Training
In-service training can be provided by an experienced stained glass artist.

Employer
- large workshops and studios
- certain factories
- churches
- self-employment, with own studio

Career 77: Tailor

Tailors make garments to customers' specifications. They follow the process through from start to finish and their tasks include: helping the customer choose the right fabric and style of garment; taking the customer's measurements; and developing a design for the garment or modifying an existing design.

A tailor may draw an individual pattern or alter a standard pattern to fit the customer, then cut and assemble the garment. The customer is then called for a fitting and the garment is put on and the tailor marks areas requiring alterations. The alterations are then done, zippers inserted, button-holes made and buttons sewn on, plus any decorative features

Many tailors specialize in alteration work, as there is a demand for this service in retail stores and dry-cleaners, which offer alterations as part of their service.

Those that work in clothing factories need to acquire the necessary technical knowledge in all phases of clothing production.

Some fulfilling and satisfying aspects of this career
- meeting new people who will hopefully make your business grow
- helping people create clothes they like and feel comfortable in
- opportunity to start own business

Some demanding and challenging aspects of this career
- concentrating and sitting for long periods can become tiring
- having to many alterations on new garments
- the pressure of working to deadlines

Purpose Orientation
A tailor should:
- be interested in clothing design, style, colour and fashion;
- acquire the necessary technical knowledge in all phases of clothing production;
- have good sewing skills;
- be able to communicate with people;
- be patient;
- have good eyesight.

School Subjects
Ordinary Level Certificate for in-service training

Advanced Level Certificate or higher qualification for training at a technical college or fashion house

Compulsory Subjects: None
Recommended Subjects: Consumer Studies

Training
Many factories have their own training centres, where beginner tailors are taught how to perform each task with minimal finger, arm and body movement.

Employer
- Large tailoring shops (manufacturing garments for up-market or specialised boutiques)
- Larger retail stores (ready-to-wear garments need to be adjusted to fit customers)
- Clothing factories
- Self-employment, set up own tailor shop

Career 78: Technical Illustrator

As manufactured products become increasingly sophisticated, there is a growing need for technical information to be presented in a form that is acceptable to both experts and lay people.

One of the most efficient ways of doing this is to use technical illustrations. Professional technical illustrators must prepare these illustrations. Technical illustration is the preparation of visual images to communicate factual information of any kind.

Technical illustrators may be required to produce illustrations of many different kinds and of many different subjects. Typical examples of technical illustrators' work include:

- three-dimensional assembled views
- three-dimensional exploded views
- sections, cut-aways and ghosted views
- functional diagrams
- flow diagrams
- electrical, pneumatic and hydraulic circuit diagrams

Subjects covered by these illustrations range from the most complex power station or aircraft, to everyday items such as cameras, calculators or televisions.

However, regardless of the type of illustration or the subject matter, technical illustrators must produce visual images that are technically accurate. Even though the work of different illustrators may vary slightly in style and presentation, they do not have the freedom to produce works of art as exhibited by either graphic artists or other artists.

Although most technical illustrations are prepared in line form using pen and ink, the technical illustrator must be able to work in various mediums, using many different techniques. These techniques include the use of an airbrush to produce more realistic images.

Some fulfilling and satisfying aspects of this career
- helping others to understand things, such as electrical appliances
- being creative and imaginative to some extent
- satisfaction of seeing the end results of your work

Some demanding and challenging aspects of this career
- limited opportunities to be creative
- possibilities of eyestrain and back discomfort

- highly detailed and time-consuming work
- occasionally having to work late to meet deadlines

Purpose Orientation
- good technical drawing skills
- keen interest in the general aspects of engineering
- fascination for finding out how things are put together and how they work
- interest in learning different drawing and painting methods
- extreme patience, dedication and accuracy
- ability to work as an individual or as part of a team

School Subjects
No specific educational requirements.

Compulsory school subjects: None
Recommended school subjects: Mathematics, Geography, Visual Arts and Engineering and Graphic Design.

Training
The comprehensive training course comprises 3 modules, each of which runs for 2 weeks. Students have to do a practical examination at the end of each module.

Employer
- armaments industry
- automotive industry
- aircraft industry
- any type of manufacturing industry
- self-employment, on a contract basis for companies in need of this service

Career 79: Technical Writer

Technical writers have to communicate complex information in simple language. They are the major link between the manufacturer and the end user through the medium of the manufacturer's documentation.

Technical writing is the communication of factual information of any kind using written words and appropriate graphic techniques. Typical examples of technical writing include:

- operating instructions for a radio, cassette player or calculator
- the instruction leaflet with medicine
- motor car workshop manual / owner's manual
- do-it-yourself manuals
- training manuals
- sales brochures
- parts lists
- company reports

Legislation compels the aircraft and armaments industries to employ technical writers. As there is an increasing emphasis on the provision of adequate documentation, the need for professionally trained technical writers to prepare the documents should also increase.

Technical writers do a great deal of research for the publications that they write, and have to consult specialists in various fields before they can begin their work. Technical writers also work closely with the technical illustrator who prepares the illustrations for the publication.

Some fulfilling and satisfying aspects of this career
- helping others to understand things, such as electrical appliances
- being creative and imaginative to some extent
- satisfaction of seeing the end results of your work

Some demanding and challenging aspects of this career
- highly detailed and time-consuming work
- occasionally having to work late to meet deadlines

Purpose Orientation
- must have patience, commitment and dedication
- must have good communication skills
- be able to give clear and simple descriptions of complex procedures and

- have a practical knowledge of graphics, three-dimensional illustrations, typography, photography and printing processes

School Subjects
There are no specific educational requirements, but employers prefer candidates with an Advanced Level Certificate.

Compulsory school subjects: English
Recommended school subjects: Engineering and Graphic Design, Mathematics, Physical Sciences

Training
Most technical writers started as tradespersons, technically qualified personnel or even journalists and eventually became interested in technical writing. However, it is an advantage to have other training before being employed as a technical writer.

Employer
- armaments industry
- aircraft industry
- mining industry
- manufacturing industry
- self-employment - trained technical writers can work on a contract basis for companies

Career 80: Textile Designer

Textile designers are responsible for the creation and development of designs or patterns which are either woven, knitted or printed on to or into cloth. They need artistic skills and sound knowledge of fabric characteristics and factory reproduction techniques to design exquisite and marketable textiles.

Textile designers work within a field where media, materials, production methods, finance and public taste all have a bearing on their work. Designers need to understand and exploit these limitations so that the fabric is readily identified with a specific need and its acceptance is facilitated.

Creative artists use their skills and experience to produce designs and colourations, not only by traditional sketches and painting techniques, but also using high-tech computers. This offers aspiring designers a totally new dimension in the exciting world of textile design.

Textile design moves with current fashion and reflects many moods and cultures. International travel, to capture design ideas and trends, becomes part of skilled designers' work when part of product management teams. With backgrounds of expertise and specialized knowledge, designers can fulfil important roles on the marketing or colouring side too.

Textile designers are mostly employed by the fashion fabrics and home textiles industries. They are sometimes expected to travel from one country to another to study fashion trends.

Some fulfilling and satisfying aspects of this career
- normal working hours
- keeping up with fashion trends
- using your creative abilities
- being able to see the end product

Some demanding and challenging aspects of this career
- having to continually research and keep abreast of public tastes to keep products selling
- working to deadlines
- eye-strain from doing detailed work
- trying to compete productivity and price-wise with the Orient

Purpose Orientation

A textile designer should:
- be artistic, creative and practical
- have basic drawing skills
- have creative imagination
- have excellent feel for colour
- be aware of fashion trends
- have understanding of all marketing avenues
- be hard working
- be able to work under pressure
- be friendly and tactful when dealing with clients
- be able to subdue personal taste to meet those of particular markets

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Visual Arts, Mathematics and History

Training
Many large home textile and fashion fabric manufacturers offer in-service training.

Diploma: The three-year Diploma in Textile Technology and/or the Diploma in Textile Design and Technology

Employer
- Studios
- Textile company (merchandiser or stylist)
- Chain groups
- Boutiques
- Garment manufacturers
- Self-employed, as consultant or doing freelance work

Career 81: Textile Technologist

Textile technologists have scientific knowledge of the structure and properties of raw and finished textiles and of the conversion of fibres or filaments to all types of fabrics, such as spinning, weaving, knitting; the manufacture of non-woven materials, dying, printing and finishing. They also need an understanding of the problems involved in the production of textile fabrics.

Raw materials of textile manufacturing pass through many hands before they become finished fabrics. These may include natural fibres such as wool and cotton or synthetic fibres such as nylon or polyester. However, regardless of the raw material used, most textiles are produced by spinning the fibre into yarn, weaving or knitting yarn into fabric and dyeing and finishing the fabric. As a result most employees in the textile industry are directly involved in production, either working with their hands or operating machinery.

Important to the textile industry, but not directly involved in production, are textile designers and textile technologists who have special talents and post-school training in order to perform effectively on technical, supervisory and administrative levels.

Professional textile technologists have a broad range of specialist areas to choose from, including: knitted shade netting, pantyhose or woven denim fabrics or curtaining, as well as carpeting and non-woven fabrics used for road or dam construction.

In industry, textile technologists are engaged in quality control of products or processes, or they are involved in supervising the production of textiles. They are also concerned with organizational and personnel problems associated with running factories.

Textile technologists also assist with technical advice in organizations concerned with the supplying or purchasing of many products used by the textile industry or in technical sales where the technologist advises customers on the best use of suitable products.

Textile technologists may also specialize in research in order to develop new or improved processes or materials. Laboratory technologists do physical, chemical or microscopic analyses on textiles, pigments and cleansing agents such as soap and detergents.

Some fulfilling and satisfying aspects of this career

- working fairly regular hours
- varied and interesting work
- working with both people and machinery

Some demanding and challenging aspects of this career
- incorrect analyses can cause great losses for a factory, thus the responsibility is high
- working in an environment that could be affected by strikes
- staying informed and up to date on technology development and improvement
- working in factories in dangerous industrial areas

Purpose Orientation
- technical skills
- artistic ability, including a sense of form, colour and design
- keen to do research and develop new products
- practical understanding of Chemistry, Physics and Mathematics
- not colour-blind
- not allergic to dust or other fine particles
- able to work well with others

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Physical Sciences

Training
Degree: BSc (Hons) graduate with Chemistry, Mathematics, Physics or Agriculture

Diploma in Textile Technology

A degree or diploma in science, with a subject such as Chemistry can also be used in the textile industry.

Employer
- textile industry for example spinning mills
- manufacturers of textile machinery and auxiliaries
- weaving and knitwear plants
- manufacturers of textile floor coverings, pantyhose, surgical dressings
- dye houses and finishing plants
- Defence Forces
- mining houses

- municipalities
- Wool Association, Cotton Association, etc.
- self-employment is rare, but can sometimes be found in small production areas where high fashion handicaps massive productions like the printing of T-shirts and embroidery. In all cases however, capital will be needed.

Career 82: Tool Designer

Tool designers assist in the design and development of the tools needed for the mass production of manufactured goods. They act as the link between the engineers, who develop ideas for machine tools, and the toolmakers, who are the artisans.

They may originate designs and prepare sketches of cutting tools, jigs, dies and other attachments, or re-design and improve existing tools. Experimental tools are constructed and tested for performance, durability and efficiency and the results of these tests analysed in written reports. Layouts and drawings of the assembly process are prepared, estimating labour costs, equipment life and plant space. The tool designer frees the engineer for more technical tasks.

Tools designers work at desks and drawing boards in offices, laboratories and shops. Work settings are usually quiet, well lit and comfortable.

Some fulfilling and satisfying aspects of this career
- doing engineering related work without years of training
- acting as a liaison between skilled workers and engineers or scientists
- working on a number of different projects and solving many problems
- generally good salaries and working conditions

Some demanding and challenging aspects of this career
- repetitive routine work
- limited advancement opportunities without more education
- working overtime if tests cannot be completed during working hours

Purpose Orientation
- interested in people and machines
- enjoy doing accurate, detailed work
- patient and resourceful
- enjoy working with a variety of people
- persistent in the face of negative results
- mathematical ability
- good eyesight and finger dexterity
- knowledge of manufacturing procedures and production methods

School Subjects
Minimum Ordinary Level Certificate
Advanced Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Physical Sciences, Engineering and Graphic Design

Training
In-service training can be undertaken, under the supervision of an experienced tool designer.

Employer
- aircraft equipment and other machinery companies
- engineering firms
- government departments
- manufacturers of motorcars

Career 83: Tool, Jig and Die Maker

The tool-, jig- and die-maker manufactures a wide variety of equipment, for example, pressing tools, jigs and gauges. These products are used by operators to mass-produce other products and parts.

In tool-making this artisan produces devices that hold metal while it is shaved, stamped or drilled. The toolmaker makes gauges and measuring devices used in the manufacture of precision parts.

Jigs are devices used to clamp pieces of metal or other material in a required position and to guide the tools being used. This eliminates the need to mark and position pieces of work individually.

These artisans construct dies (forms) to shape metal used in stamping and forging operations. Moulds are also made for die-casting and for moulding plastics.

The tool-, jig- and die-maker may also build and repair worn or damaged dies, gauges and fixtures.

Some fulfilling and satisfying aspects of this career
- the satisfaction of being a skilled craftsman
- job security (one's skills and knowledge are in demand)
- job mobility (a wide variety of jobs to which one can move)

Some demanding and challenging aspects of this career
- the possibility of injury on the job
- the continuous attention and concentration required
- having to work in a hot, noisy and dirty environment at times
- having to be on one's feet most of the time

Purpose Orientation
A tool-, jig- and die-maker should:
- enjoy working with his hands;
- be able to concentrate on details;
- be a precision worker;
- have a good working knowledge of mathematics and mechanics;
- be able to read and understand drawings;
- be good at solving problems;

- have finger and manual dexterity;
- be in good physical health and have stamina;
- be able to visualize mechanical and physical relationships between objects.

School Subjects
Ordinary Level Certificate in the metal industry
Advanced School Certificate in the motorcar, weapon and aerospace industries

Compulsory Subjects: None
Recommended Subjects: Mathematics, Physical Sciences, Engineering and Graphic Design, Mechanical Technology

Training
Apprenticeship training

Employer
- Motor car manufacturing
- Metal industry
- Aerospace industries
- Engineering factories
- Plastics industries
- self-employment, with enough experience, can practise this trade on a private basis

Career 84: Upholsterer

Upholsterers are responsible for applying the soft finishes to furniture. They also repair and rebuild sofas, chairs, car seats and other upholstered furniture.

An upholsterer will remove the old covering and padding from the seat, arms, sides and back of the piece being redone. The webbing might also be removed and replaced with new webbing, along with any defective springs. The upholsterer then measures and cuts materials for the new covering; sews and attaches the material to the frame; and finally adds any required trimming such as braid or buttons. Upholsterers are also sometimes required to refinish the wooden surfaces of furniture items.

Upholsterers should have knowledge of the ergonomics of design, different finishes, fabrics, foams and webbing. They may work in factories, with interior designers or directly with customers who determine the work to be done and the type of fabric to be used.

Some fulfilling and satisfying aspects of this career
- making or remaking items that enhance the comfort of people
- working with your hands
- fairly good job security for semi-skilled workers
- the possibility of starting one's own business
- sometimes working with lovely pieces of furniture

Some demanding and challenging aspects of this career
- limited employment opportunities and prospects of promotion
- tiring physical work
- working with difficult or over-demanding customers

Purpose Orientation
An upholsterer should:
- be willing to undergo a selection test battery;
- have finger and manual dexterity;
- have good coordination;
- move large and heavy pieces of furniture;
- accurately calculate the amount of material required;
- enjoy working with his hands;
- work well without supervision;
- be creative;
- have an eye for detail;

- work quickly, accurately and neatly.

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None
Recommended Subjects: Consumer Studies, Mathematics

Training
Registration is required with a suitable employer offering training.

Employer
- Furniture manufacturers
- Cabinet makers
- Kitchen manufacturers
- Building contractors
- Self-employment, with enough experience, can start own business

Career 85: Vehicle Body Builder

Vehicle body builders design and build the chassis and body of vehicles such as trucks, trailers, caravans, panel vans and buses.

They work from plans, drawings and specifications. Materials are measured out, sawn or cut to size, fitted and welded together. The floor of the bodywork is then manufactured and bolted onto the chassis. Metal beams are cut, welded together and reinforced to form a sturdy frame for the body.

The panels of the bodywork are made from various sizes and thicknesses of sheet metal panels which are welded or riveted together onto the framework. Different materials are used for the inside panels to insulate or soundproof where necessary. The vehicle body is then cleaned and painted and windows are installed and fitted. Finally, the electrical fittings and other trimmings are installed.

Some fulfilling and satisfying aspects of this career
- challenging work
- being creative and producing something useful
- working independently
- variety of tasks

Some demanding and challenging aspects of this career
- physically tiring having to handle heavy materials and machinery
- noise associated with metalworking

Purpose Orientation
A vehicle body builder should:
- like to work with his hands;
- have a certain amount of mechanical insight and good spatial perception;
- be able to read plans and interpret specifications;
- enjoy assembling and dismantling engines and other mechanical devices;
- be dexterous and good at handling tools;
- have good eye-hand coordination;
- be physically strong and healthy with plenty of stamina.

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Mechanical Technology, Engineering and Graphic Design, Mathematics, Physical Sciences

Training
Apprenticeship training

Employer
- Vehicle manufacturers
- Municipalities
- Private panel-beating concerns
- Government undertakings
- Explosives and allied industries
- Self-employment, with enough experience, initiative and capital, can start own business

Career 86: Vehicle Spray Painter

Vehicle spray painters use spray guns to spray paint onto the bodywork of vehicles and other items, to change the colour or to repaint scratched or damaged paintwork.

When repainting damaged paintwork of a vehicle, they prepare the body work by removing dirt or grease; they smooth parts that are rough or have been panel beaten; remove old paint with sandpaper or paint-removing chemicals; they cover the rest of the bodywork with paper in order to protect it; then they apply a preliminary coating of primer and a thin layer of primer-filler.

Spray painters mix paints until exactly the same shade as the rest of the vehicle is obtained before the final four or five coatings of the required colour are applied. Paint has to be applied evenly and each coat is allowed to dry thoroughly.

Some fulfilling and satisfying aspects of this career
- being able to see the results of a good job immediately
- good earnings
- the possibility of starting own business

Some demanding and challenging aspects of this career
- limited opportunities for promotion
- health hazards inherent in the work
- having to stand for long periods

Purpose Orientation
A spray-painter should:
- have good eyesight and colour sense;
- be able to distinguish between various shades of the same colour;
- have balanced eye-hand coordination;
- be able to stand or crouch for long periods;
- work very accurately, carefully and neatly;
- have patience.

School Subjects
Ordinary Level Certificate.
Some employers demand higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Mechanical Technology

Training
The learner spray-painters learn the aspects of their trade through practical experience under the supervision of skilled artisans.

Employer
- Automotive body repair shops
- Garages
- Specialist spray painting firms
- Motor vehicle manufacturers
- The aerospace industry
- Manufacturing industry where articles are made and spray painted
- Self-employment, with enough experience, can practise trade on a private basis or start own business

Career 87: Vehicle Washer

Vehicle washers clean the interior and exterior of customers' motor vehicles.

They clean the interior with automatic cleaning equipment, such as vacuum cleaners and wash the exterior with water and automotive cleaning products. The vehicle is then dried and polished, waxed and other protection products applied.

Some fulfilling and satisfying aspects of this career
- working mostly outdoors
- working with people
- receiving good tips when good service is provided

Some demanding and challenging aspects of this career
- dealing with rude and over-demanding people
- boredom during slack periods
- not very high remuneration

Purpose Orientation
A vehicle washer should:
- be physically fit;
- be interested in motor vehicles and getting them to look their best;
- be honest (people often forget to remove valuable possessions from their cars when taking them for cleaning).

School Subjects
No specific requirements

Compulsory Subjects: None
Recommended Subjects: None

Training
In-Service Training:
The worker is trained to effectively perform the duties.

Employer
- Petrol stations
- Vehicle service centres
- Independent vehicle cleaning units

- Large corporations
- Self-employment, can work independently and with enough capital, start own car washing business

Career 88: Watch Maker

Watchmakers are responsible for the maintenance, repair and setting of digital and analogue watches.

Watchmakers receive broken or defective watches, listen to customers' complaints and trace faults. They dismantle watches, repair or replace broken or worn parts and assemble the watches again. They adjust, set, where applicable, wind them up and test them.

Watchmakers also clean, service and oil clocks. When parts are unobtainable watchmakers may manufacture them.

Watchmakers employed in the manufacturing industry, assemble watches, adjust, and set them. Watchmakers may also repair jewellery, silverware and other items.

Watchmakers, who own their own shops, supervise employees, keep records, order parts and supplies and perform other managerial duties.

Watchmakers usually work in quiet, clean and pleasant workshops. They use fine and delicate instruments. They may also work in the workshops of large jewellery manufacturing firms under similar working conditions.

Some fulfilling and satisfying aspects of this career
- the challenges that the job presents
- job stability and relatively good wages
- working with fine, delicate mechanisms
- tranquillity of the work situation
- prospects of a private business

Some demanding and challenging aspects of this career
- long hours of concentration
- having to deal with people who may be unreasonable
- the long training required for this occupation

Purpose Orientation
A watchmaker should:
- have high personal standards of craftsmanship;
- have mechanical insight and aptitude;
- be honest in dealing with customers;
- be able to concentrate
- pay attention to fine detail;
- work accurately;
- have patience and perseverance;
- have very definite finger dexterity;
- have very good eyesight;

- have good eye-hand coordination and orientation as well as excellent depth perception.

School Subjects
Ordinary Level Certificate

Compulsory Subjects: None
Recommended Subjects: Mathematics, Physical Sciences, Engineering and Graphic Design, Electrical Technology

Training
Watchmaking is not a designated trade. Practical as well as theoretical training is provided. Experienced watchmakers train aspirant watchmakers. Further training is available for workers who are interested in management and who show leadership qualities.

Employer
- jewellers
- manufacturers of watches
- wholesalers of watches
- self-employment, a skilled and entrepreneurial watchmaker can start own workshop

Career 89: Weaver

There are two types of weavers: hand weavers and operators of mechanised weaving machines.

Hand weavers weave cloth on table or floor looms. They need to have sufficient knowledge of the weaving process to enable them to control the quality of the final product. They work either to specific instructions in a factory-type setting or independently as an artistic weaver creating their own designs.

Weavers who operate automated weaving machines in textile factories need to acquire expertise in operating the automated machinery.

Their tasks include:

- observing the machine-weaving process for defects
- removing defects in the cloth by cutting and pulling out filling
- examining automated looms to determine the causes of stoppages
- marking or cutting cloth to specified lengths
- placing bobbins on non-automatic looms

Some fulfilling and satisfying aspects of this career
- working with your hands
- creating beautiful items or cloth
- seeing the end results of your work

Some demanding and challenging aspects of this career
- physical demands of standing or sitting in the same position for long periods
- working with inferior thread at times
- noisy working environment
- not very high remuneration

Purpose Orientation
A hand weaver should:
- be patient and meticulous;
- enjoy working with his hands;
- have a creative imagination;
- have a flair for and knowledge of the principles of textile design.

A machine weaver should:

- have manual dexterity;
- have physical stamina;
- be able to concentrate on a monotonous process for long periods;
- have a 'quick' eye to detect weaving defects.

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

No specific requirements for the technical college courses

Compulsory Subjects: None
Recommended Subjects: Visual Arts, Mathematics

Training
Diploma in Textile Design and Technology

In-service training is offered by some employers.

Employer
- Textile manufacturers
- Clothing factories
- Own weaving operations
- Self-employment, with enough experience and capital, can start own weaving operation

Career 90: Welder

Welders play key roles in the manufacturing process. Their work varies from repair and maintenance welding, to construction and fabrication.

Welders' skills are used in the construction and maintenance of pipelines, boilers, nuclear reactors, pressure vessels, motor vehicles, oil rigs and turbine castings. They need to be competent in welding many types of metal (mild steel, stainless steel or aluminium) using various processes. Recognising welding defects and being able to rectify them are also part of the job.

Welders must also be able to identify welding electrodes and filler wire compositions and know how to store and dry electrodes and fluxes. The most common types of welding are electric, arc, resistance and gas welding. Other methods include the use of electron beams and laser beams.

Some fulfilling and satisfying aspects of this career
- good job prospects
- being able to choose from a number of industries and specialization fields
- some physically disabled people can become welders

Some demanding and challenging aspects of this career
- standing and stooping for long periods of time
- possibility of injury on the job
- relatively dirty working environments

Purpose Orientation
A welder should:
- be willing to conform to rigid standards of performance;
- be able to produce work of high quality;
- be able to concentrate.
- work accurately and carefully;
- have manual dexterity;
- have good eyesight;
- be willing to keep up-to-date with advances in technique and equipment.

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None

Recommended Subjects: Civil Technology, Mechanical Technology, Mathematics, Physical Sciences

Training
Apprenticeship training

Employer
- Motor manufacturing industry
- Electricity supply industry
- Explosives and allied industries
- Metal industries
- Railway undertakings
- Heavy and light engineering industries
- Gate and fence industry
- Self-employment, with enough experience can practise this trade on a private basis or start own business

Career 91: Wood Machinist

Wood machinists produce furniture components for the making of furniture.

In large furniture factories, about 16 different machines are used, ranging from the simplest band-saw to the most complex computer controlled spindle moulder. Wood machinists have to set up, adjust, operate and maintain them all.

Unprepared wood is sawn to the required shape and size. It is then transported to the planing machine. If the joining of wood or panels of wood is necessary, dowel pins are inserted. Details, according to design specifications, are then marked off on the wood. The next machine is then set and adjusted to obtain the required form. The wood is held firmly in place with set apparatus.

Some of these tasks require special skills, whilst others are completed automatically by the machine.

Some fulfilling and satisfying aspects of this career
- good employment opportunities
- good pay
- a variety of work projects
- working with one's hands
- satisfaction derived from seeing the finished products

Some demanding and challenging aspects of this career
- a lot of standing
- stooping and lifting
- dust which may irritate the respiratory system
- noise from machines
- the possibility of injury on the job

Purpose Orientation
A wood machinist should:
- willing to undergo a selection test battery;
- be a neat and accurate worker;
- be able to concentrate for relatively long periods;
- always be cautious in handling dangerous and powerful machines;
- have mechanical insight and skills;
- have average physical strength;
- have manual dexterity;

- have good eyesight.

School Subjects
Ordinary Level Certificate

Compulsory Subjects: None
Recommended Subjects: Engineering and Technology, Mathematics

Training
Register with an employer providing suitable training.

Employer
- Furniture manufacturers
- Cabinet-makers
- Kitchen manufacturers
- Building contractors
- Self-employment, with enough experience, initiative and capital, can open own small woodworking factory

Career 92: Wood Scientist

Wood science is a material science in which the physical, chemical and biological properties of wood are studied.

Wood scientists apply the knowledge gained from their studies to develop and improve technologies for processing wood into pulp, paper, building and construction timber, chip and fibreboard and laminated beams. Wood scientists may work in a wood processing plant (pulp and paper), sawmill or furniture and board factories.

They often end up working in research, management, administration, process development, materials engineering, quality control, manufacturing, production, marketing or sales.

Some areas of specialization for wood scientists include:

- New fibre sources: research focuses on using sisal as a cheaper alternative to glass fibre in reinforced plastics. TMP/CTMP pulping properties of new Pine species are carried out

- Bio pulping studies: pulp evaluation of different Pine and Eucalyptus species. Chipping, chip screening, Kraft cooking and testing of pulp strength properties according to Tappi standards

- Utilisation of various industrial by-products: a number of industrial by-products are used to develop new types of mineral bonded fibre and plastic / plastic composite materials to be used as building components

- Kaolin: research to upgrade locally beneficiated kaolin for coating applications. Print quality evaluations of coated paper by image analytical techniques are carried out.

- Handmade paper: expertise on all aspects of handmade paper production

- On-line control of chemical additives in papermaking: development of process control loops to monitor wet end chemistry during stock preparation and sheet formation. Control over added chemicals will minimize process variability and improve product uniformity.

- Durability testing of exterior surface finishes on wood: the performance of various coating systems is tested under natural exposure and artificial weathering conditions in the laboratory

- Wood drying: development of new kiln designs and construction materials; optimal drying control using discrete on-line mathematical models of moisture movement; development of new

methods of wood moisture measurement above fibre saturation point

- Solar drying. non-conventional kiln design.

- Drying schedule development, includes chemical analysis of wood: quantitative chemical wood analysis; wood preservation: study of factors degrading wood, methods of treatment and test methods

Some fulfilling and satisfying aspects of this career
- working with a natural product
- variety of specializations to choose from
- good job opportunities
- good remuneration possibilities

Some demanding and challenging aspects of this career
- working with uncooperative staff
- sometimes working in noisy or dust filled environments

Purpose Orientation
A wood scientist should:
- have an aptitude for Mathematics and Physical Science;
- be interested in technology;
- think creatively;
- have organisational abilities;
- have good interpersonal and communication skills.

School Subjects
Advanced Level Certificate meeting degree requirements for a diploma and degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Engineering and Technology

Training
Degree: BSc Wood Science or BEng (Chemical Engineering) with special emphasis on pulp and paper subjects from the third year.
Wood Technology

Employer

Wood scientists, in mechanical processing, are employed by:

- saw mills
- factories (plywood, chipboard, fibreboard, laminated beams)
- furniture factories

Wood scientists, specialized in chemical processing, are employed by:

- pulp and paper industries

There are also good career opportunities for wood scientists in the research field and in their own enterprises. As wood scientists' skills are highly specialized they can work as consultants to large corporations. They can also set up companies that process wood for the purpose of timber construction.

Career 93: Wood Technologist

Wood technologists are trained to function as line managers in saw mills or other timber processing plants. They apply practical and academic knowledge of timber and timber processing technology to the process of converting raw timber to saleable products such as plywood or particle-board, thus ensuring quality standards and efficiency.

Wood technologists can be involved in:

- obtaining of timber; preparation, storage and control of raw materials
- efficient and cost-effective conversion of these raw materials
- transport within and outside the processing plant
- storage and control of finished products
- marketing; management and training of staff
- cost and quality control
- plant safety and equipment maintenance
- in-company, industrial and scientific research

Some fulfilling and satisfying aspects of this career
- working with a natural product
- variety of areas in which to work
- good job opportunities
- good remuneration possibilities

Some demanding and challenging aspects of this career
- working with uncooperative staff on occasion
- sometimes working in noisy or dust-filled environments

Purpose Orientation
A wood technologist should:
- enjoy working with wood and timber products;
- have a technical aptitude;
- be able to organize and control a number of processes;
- be able to supervise and motivate people.

School Subjects
Advanced Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics
Recommended Subjects: Physical Sciences, Life Sciences, Accounting, Economics

Training
Diploma in Wood Technology is a 3-year

Employer
- Saw mills and timber processing plants
- Plywood plants
- Timber housing companies

As the training covers a wide range of aspects relating to the industry, wood technologists can apply their skills and knowledge to other industries, such as furniture manufacture, joinery and timber building and construction. Wood technologists who do not wish to stay in line management, can opt for specialization in other areas of the timber industry e.g. marketing, training and research.

Career 94: Woodcarver

A woodcarver carves beautiful images and designs into selected pieces of furniture. The types of products a woodcarver will design and carve include lyre-backed chairs, ball-and-claw feet for tables and chairs, ribbon-festooned aprons of tables, drawer fronts of chests, tea coasters and the like. Although much of the work previously done by hand is now done by machine, some tasks still require the skill and ingenuity of the woodcarver.

The woodcarver marks with chalk those pieces of wood which must be cut away. The woodcarver lays the article on a workbench or clamps it firmly in a bench vice and slowly cuts and chisels away the wood. Care needs to be taken not to cut away too much wood. The article is then finished by sand papering it carefully and staining or varnishing it.

Woodcarvers can specialize in the type of wood they use. They can also specialize in imitation antique furniture or the restoration of antique furniture.

Some fulfilling and satisfying aspects of this career
- working with your hands
- working alone in a peaceful atmosphere
- the challenge which the job presents
- being creative and exercising your skill
- seeing the results of your handiwork

Some demanding and challenging aspects of this career
- poor promotion prospects
- not very good remuneration unless exceptionally talented
- having to work on one's own with little contact with others

Purpose Orientation
A woodcarver should:
- willing to undergo a selection test battery;
- be dexterous and skilled with his hands;
- be artistic and enjoy working with wood;
- be careful and patient;
- work accurately and neatly;
- enjoy working alone;
- have good eye-hand coordination;
- have good eyesight;
- have a feeling for form and line;

- be physically healthy and strong;
- be able to handle heavy pieces of furniture;
- be able to stand all day;
- have perseverance to practise the required skills.

School Subjects
Ordinary Level Certificate

Compulsory Subjects: None
Recommended Subjects: Engineering and Technology, Mathematics

Training
Register with an employer providing suitable training.

Diploma in Furniture Production

Employer
- Woodworking shops like large furniture manufacturers
- Factories that manufacture collector's pieces or hand-carved furniture
- Building contractors
- Carpentry shops
- Furniture manufacturers
- Cabinet-makers
- Self-employment, own small woodworking factory

Career 95: Wool Classer

Wool classers are responsible for the shearing and wool-classing process. They organize the activities in and around shearing sheds and ensure that the wool is sorted straight after shearing, and classed.

They are responsible for:

- coordination between wool farmers, the shearing team and other wool workers
- organization of the shearing shed and shearing process
- ensuring that the correct shearing methods are used, as this will make the classing of wool easier
- the classing of the wool according to aspects such as compactness, quality, condition and appearance
- the correct pressing, closing and marking of bales
- sending of bales to the wool markets
- sending classing reports to brokers.

Some fulfilling and satisfying aspects of this career
- working with a natural product
- working in an informal environment that is relatively stress free

Some demanding and challenging aspects of this career
- hard physical work
- sometimes having to service or maintain the machines, which may delay the classing process

Purpose Orientation
A wool-classer should:
- enjoy physical work and be in good health;
- love sheep farming;
- be able to contribute to a pleasant working environment in the shearing shed;
- be disciplined, honest and hard working;
- have supervisory skills.

School Subjects
Advanced Level Certificate.

Compulsory Subjects: None
Recommended Subjects: None

Training

Wool-classing courses are offered from time to time at all agricultural colleges or on farms if requested

Employer

- Wool brokers
- Shearing contractors
- Wool farmers
- Self-employment

Career 96: Wrapper and Labeller

Wrappers and labellers are responsible for the neat packaging and coding of articles before dispatch.

Labellers set labelling machines according to the size and form of the labels. They place containers on a conveyor belt that takes them through an electronic eye activating the printing device that prints the batch number and expiry date on the label and ejects the label for adhesion onto the container. They monitor the machine to see when the ink has run out and they keep an eye on the quality of the printing and report any problems.

Wrappers are the last people on the packaging line. They arrange boxes into neat piles and roll off enough plastic film to cover each pile. They cut the plastic film by bringing down a reel. They then send the pile through an oven to shrink the plastic film, and place the pile onto a pallet, ready for dispatch.

Some fulfilling and satisfying aspects of this career
- working with your hands
- being able to get a job with little formal education

Some demanding and challenging aspects of this career
- physically tiring work
- lifting heavy parcels
- limited prospects for promotion
- boredom doing routine tasks

Purpose Orientation
Wrappers and labellers should:
- be able to perform the same task for long periods without getting bored or making mistakes;
- have good hand dexterity;
- have good eye-hand coordination;
- work safely.

School Subjects
Ordinary Level Certificate
Advanced Level Certificate is recommended

Compulsory Subjects: None

Recommended Subjects: None

Training
Wrappers and labellers are trained on the job by experienced workers.

Employer
- Manufacturers of products that need wrapping and labelling.

Career 97: Wrecker and Dismantler

Wreckers and dismantlers recover parts of vehicles to sell to the public. When motor vehicle accidents occur, the entire vehicle is not necessarily damaged or destroyed and many parts may still be in excellent working condition. Those are the parts that wreckers and dismantlers remove and sell.

Many motor mechanics who are trying to save their clients' money, approach a wrecker and dismantler for second-hand parts such as radiators, batteries and engines to replace worn out ones They remove bumper-bars, steering wheels, panels, seats etc by using hand and power tools. They also dismantle electrical components, brakes, transmission systems, engines and other parts that can be sold.

Where necessary they clean various parts, and store and tag the components and parts for resale. Wreckers and dismantlers remove the vehicle body parts that cannot be reused from the yard by using a crane or forklift. These are dumped in a separate area. They handle telephonic enquiries, but people usually like to visit the premises to see the parts before purchasing. They are not only involved in selling used parts, but also need to do a certain amount of minor clerical work.

Wreckers and dismantlers need to know the technical details about the products they sell, and what prices such products should fetch. In order to remove components and parts, wreckers and dismantlers need to be quite strong physically.

They work in office and storage facilities as well as outdoors, dismantling vehicles in the scrap yards. They use tools such as hammers, cranes, forklifts, cash registers, general office equipment, including computers.

Some fulfilling and satisfying aspects of this career
- helping people who cannot afford new car parts
- providing a service to the community

Some demanding and challenging aspects of this career
- physically hard work
- potentially dangerous working environment

Purpose Orientation
- a good communicator
- have manual dexterity and some technical ability
- physically fit and strong

- quick and efficient
- interested in motor vehicles

School Subjects
No specific requirements

Training
In-service training under the supervision of an experienced wrecker and dismantler.

Employer
- mechanical shops
- scrap yards
- self-employment