Programmes offered in the Department of Chemistry

- Diploma in Analytical Chemistry
- Advanced Diploma in Analytical Chemistry
- Diploma in Polymer Technology
- Diploma in Chemical Process Technology
- BSc Chemistry (Major) and BSc Honours (Chemistry)
- Honours in Formulation Science
- MSc (Chemistry)
- MSc (Nanoscience)
- PhD (Chemistry)

Institutes linked to the Department of Chemistry

InnoVenton

Institute for Chemical Technology is a formally registered Research Institute at the Nelson Mandela University whose principal research focus is in Product and Process Development. The Institute strives to be self-sustaining through income generated from services to industry, income from technology transfer projects and royalties from patents. The Institute incorporate the Downstream Chemicals Technology Station, a Government funded initiative to make available high level research, technological services and training to technology based Small and Medium Enterprises, and South African industry as a whole.

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Centre for Rubber Science and Technology

The Centre for Rubber Science and Technology (CRST) draws on Nelson Mandela University's historic experience in chemical rubber science and technology. Its activities include the advancement of rubber related research and development programmes across various disciplines such as Chemistry, Environmental Science and Computer Science; training for the needs of the rubber and tyre manufacturing industries within South Africa; and providing analytical and technical services to the South African rubber and tyre manufacturing and recycling industry.

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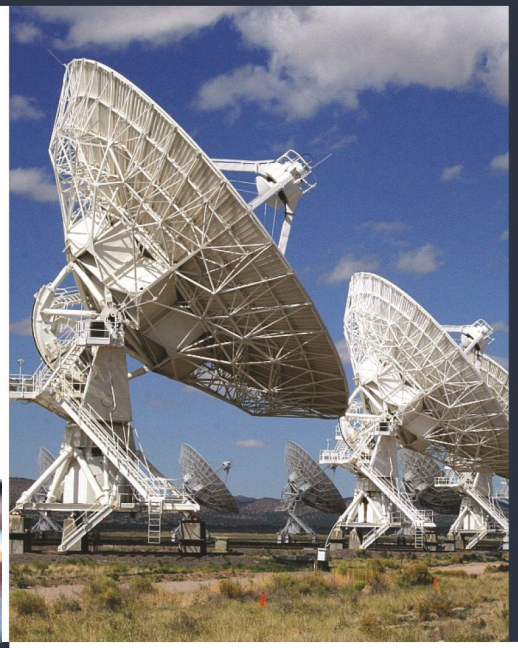
Faculty of Science



Department of Chemistry

Diploma in Polymer Technology

Programme Overview

Polymer Technology can be described as the manufacture, processing, analysis and application of long chain molecules. Materials that are typically classified as polymers include plastics, paints, rubber, foams, adhesives, sealants varnishes and many more. These materials, today, fully control the high technology era we live in. The industries that are totally dependent on polymers include information technology, aerospace, music, clothing, medical, motor manufacturing, building, packaging and many more.

The Diploma in Polymer Technology is a three year programme consisting of two years of full time study and one year Work Integrated Learning (WIL) component, which is carried out in the third year of study. This can be done in any polymer related industry such as the motor-manufacturing and supply - and - service industries, such as paint, tyres and plastics. The theoretical and practical skills based training starts with a more general Chemistry, Maths and Physics course to lay the foundation for the more specialized training in the manufacturing techniques, equipment, physical testing and analysis of polymers, rubber compounds and paint formulations. Practical training focuses on polymer synthesis, polymer processing techniques such as mixing, callandering, extrusion and injection moulding. Physical, mechanical, rheological and thermal testing of polymers is also carried out. Mechanical testing include tensile, shear, flexural and compression testing whilst physical testing include density, hardness and scratch resistance, to name but a few. These tests ensure polymeric materials meet application performance requirements. Thermal testing of polymeric materials include Differential Scanning Calorimetry (DSC), Thermogravimetric analysis (TGA) for various applications, e.g. specific heat capacity, enthalpy change, crystallinity, melting, vaporization, sublimation, thermal decomposition and temperature stability. This coupled with the Analytical Techniques modules, provides the student with a wide range of analysis methods, including modern instrumental analysis methods such as Gas Chromatographs, Liquid Chromatographs (HPLC), auto-titrators, ultraviolet and infrared spectrometers, atomic absorption and emission spectrometers, for the analysis of a wide range of polymeric products.

Graduate Attributes

Graduates will develop the following skills during their course of study so as to qualify for entry level positions in supply - and - service industries.

- Perform basic laboratory operations such as weighing, measure precise volumes, heating, transfer solids accurately from one vessel to another etc.
- Using conventional and modern procedures for the quantitative analysis of polymeric products.
- Proficiency in industry standard techniques used in surface coatings, plastics, rubber and related industries.
- Expertise in compiling and processing laboratory/physical test data, writing scientific reports and submitting results using computerized software.
- Following Good Laboratory Practice (GLP), Standard Operating Procedures (SOP), current Good Manufacturing Practices (cGMP) compliance.

Career Opportunities

Polymer Technology is an applied scientific field, hence Polymer Technologists are largely employed in technical divisions of companies where they are involved in the production management, design and formulation of polymeric products such as motor tyres, moulded plastic products and paints, used in a wide array of applications.

Quality control in this manufacturing sector is of utmost importance to ensure that the manufactured products meet the desired specifications intended for their purpose. Apart from career opportunities in existing industries, there is also big potential for entrepreneurial activities. Polymer Technology is thus, a multi-disciplinary career field, that offers highly challenging and financially rewarding career opportunities.

Typical Job Functions

- Perform qualitative and quantitative analysis on polymeric materials and manufactured goods.
- Design and develop formulations for various polymeric products.
- Testing of raw materials and final products during the various stages of the manufacturing chain.
- Develop new and/or improve the application of existing polymeric products.
- Communicate their results and conclusions in the workplace.

Major companies in South Africa that employ Polymer Technologists are Plascon, Aberdare, Woodoc, Chemserve, VWSA, GM, DuPont, BASF, Plastamid, Sasol, Bayer, Nampak, Goodyear, Bridgestone, Continental Dunlop, CSIR.

Admission requirements

To study for the Diploma in Polymer Technology you will need:

- Minimum National Senior Certificate (NSC) statutory requirements for a diploma must be met.
- An applicant with NSC Grade 12 Mathematics requires a minimum applicant score of 350.
- NSC achievement rating of at least 55% for Mathematics.
- NSC achievement rating of at least 50% for Physical Sciences

Curriculum:

Year 1 (Full time attendance)

Analytical Chemistry I
General Chemistry I
Computer Skills I
Mathematics I
Physics I
Organic Chemistry II
Paint Technology II
Polymer Technology II (Rubber and Plastics)
Polymer Raw Materials II (Rubber and Plastics)

Year 2 (Full time attendance)
Polymer Science II
Polymer Raw Materials III (Rubber and Plastics)
Paint Technology III
Polymer Technology III (Rubber and Plastics)
Analytical Techniques III
Polymer Science III
Process Chemistry III

Practical training forms an integral part of skills development and is presented as separate modules for all subjects.

Year 3 (1 Year Work Integrated Learning)
Polymer Production Practice III