

University of Pretoria Yearbook 2024

BScHons (Applied Science) *Metallurgy - Welding Technology* (12243036)

Department Materials Science and Metallurgical Engineering

Minimum duration of study 1 year

Total credits 150

NQF level 08

Programme information

The successful completion of NFM 701 Basic Physical Metallurgy 701 through Enterprises at UP is compulsory for students with a first degree of BTech or BSc.

The BScHons (Applied Science) degree is conferred by the following academic departments:

- Chemical Engineering
- Civil Engineering
- Industrial and Systems Engineering
- Materials Science and Metallurgical Engineering
- Mechanical and Aeronautical Engineering
- Mining Engineering

Any specific module is offered on the condition that a minimum number of students are registered for the module, as determined by the relevant head of department and the Dean. Students must consult the relevant head of department in order to compile a meaningful programme, as well as on the syllabi of the modules. The relevant departmental postgraduate brochures must also be consulted.

Admission requirements

1. Three-year BSc (or equivalent) degree (in Natural Sciences)
with a cumulative weighted average of at least 60% for the degree
or
relevant BTech qualification excluding the National Diploma; i.e. one offered by a department of materials science and metallurgical engineering at a university of technology in South Africa
with a cumulative weighted average of at least 75% for the degree
and
no modules failed in the BTech degree
or
a relevant Advanced Diploma qualification (NQF Level 7), excluding the National Diploma; i.e. one offered by a department of materials science and metallurgical engineering at a university of technology in South Africa
with a cumulative weighted average of at least 70% for the diploma

- and
no modules failed in the Advanced Diploma
or
a four-year engineering-based university degree not recognised by ECSA for registration as a professional engineer
or
BEng degree awarded by the University of Pretoria
or
relevant four-year bachelor's degree in engineering that the Engineering Council of South Africa (ECSA) regards as acceptable for registration as a candidate engineer and for eventual registration as a professional engineer
2. An entrance examination may be required
 3. Comprehensive intellectual CV

Examinations and pass requirements

Refer also to G18 and G26.

- i. The examination in each module for which a student is registered, takes place during the normal examination period after the conclusion of lectures (i.e. October/November or May/June).
- ii. G18(1) applies with the understanding that under exceptional circumstances an extension of a maximum of three years may be approved: provided that the Dean, on recommendation of the relevant head of department, may approve a stipulated limited extension of this period.
- iii. A student must obtain at least 50% in an examination for each module where no semester or year mark is required. A module may only be repeated once.
- iv. In modules where semester or year marks are awarded, a minimum examination mark of 40% and a final mark of 50% is required.
- v. No supplementary or special examinations are granted at postgraduate level.

Pass with distinction

A student passes with distinction if he or she obtains a weighted average of at least 75% (not rounded) in the first 128 credits for which he or she has registered (excluding modules which were discontinued timeously). The degree is not awarded with distinction if a student fails any one module (excluding modules which were discontinued timeously). The degree must be completed within the prescribed study period.

Curriculum: Final year

Minimum credits: 150

Core modules

Fabrication engineering 700 (NFE 700)

| | |
|------------------------|---|
| Module credits | 30.00 |
| NQF Level | 08 |
| Prerequisites | No prerequisites. |
| Contact time | 48 contact hours per semester |
| Language of tuition | Module is presented in English |
| Department | Materials Science and Metallurgical Engineering |
| Period of presentation | Semester 1 or Semester 2 |

Module content

This module looks at quality assurance and control in welded fabrication and manufacture, and introduces various standards and codes of manufacture used in the welding industry. Measurement, control and recording in welding, the principle of fitness for purpose, as well as health and safety issues are addressed. Control of residual stresses and distortion during welding, non-destructive testing, repair welding, and the economics of welding are considered. This module also examines plant facilities, welding jigs and fixtures. Special emphasis is placed on the design and implementation of welding procedure specifications, procedure qualification records and quality control plans. A number of case studies are examined.

Research project 700 (NLO 700)

| | |
|------------------------|---|
| Module credits | 30.00 |
| NQF Level | 08 |
| Prerequisites | No prerequisites. |
| Contact time | 48 contact hours per semester |
| Language of tuition | Module is presented in English |
| Department | Materials Science and Metallurgical Engineering |
| Period of presentation | Semester 1 or Semester 2 |



Module content

The refereed literature on a specific topic (normally related to subsequent research towards a master's degree) is studied and summarised in a written report. The important skills are finding appropriate papers, reading and comprehending these, and using the information in the paper to construct your own view on the research topic. There are no formal contact sessions. The first part of this module involves definition of a research topic (to be approved by the head of the department), development of a literature survey and compilation of a detailed research proposal. The second part of the module involves generation, presentation and critical interpretation of a project plan/results, and compilation of a written report and an oral presentation. The written document must be submitted at the end of October, with an oral presentation of 20-30 minutes in the week following submission of the survey.

Welding metallurgy 700 (NSW 700)

| | |
|-------------------------------|---|
| Module credits | 30.00 |
| NQF Level | 08 |
| Prerequisites | No prerequisites. |
| Contact time | 48 contact hours per semester |
| Language of tuition | Module is presented in English |
| Department | Materials Science and Metallurgical Engineering |
| Period of presentation | Semester 1 or Semester 2 |

Module content

This module examines the basic physical metallurgy and heat treatment of various metals and alloys, and the application of various mechanical testing techniques, microstructural analysis and corrosion testing to characterise metals and alloys. The structure and properties of welds in carbon steels, stainless steels, cast irons, copper and copper alloys, nickel and nickel alloys, aluminium and aluminium alloys and other materials (Ti, Mg, Ta and Zr) are discussed. Defects are discussed and various techniques to avoid the formation of these defects in welds are considered.

Welding processes 700 (NWP 700)

| | |
|-------------------------------|---|
| Module credits | 30.00 |
| NQF Level | 08 |
| Prerequisites | No prerequisites. |
| Contact time | 48 contact hours per semester |
| Language of tuition | Module is presented in English |
| Department | Materials Science and Metallurgical Engineering |
| Period of presentation | Semester 1 or Semester 2 |

Module content

This module examines arc physics, electrotechnics as applied to weld power sources, and power source design. The fundamental principles, applications, consumables and process variables of various arc welding processes, oxy-gas welding techniques, resistance welding processes, power beam processes and solid-state welding techniques are considered. Brazing and soldering, cutting, surfacing and metal spraying techniques are discussed. The module also looks at the welding of plastics, ceramics and composites, and at the mechanisation and use of robotics in the welding and joining industries. Practical training is included in this module.

Design of welded structures 701 (NWP 701)

| | |
|-------------------------------|---|
| Module credits | 30.00 |
| NQF Level | 08 |
| Prerequisites | No prerequisites. |
| Contact time | 48 contact hours per semester |
| Language of tuition | Module is presented in English |
| Department | Materials Science and Metallurgical Engineering |
| Period of presentation | Semester 1 or Semester 2 |

Module content

This module examines welded joint design, the basics of weld design and the role of fracture mechanics in joint design. The behaviour of welded structures under different types of loading are considered, with special focus on the design of welded structures with predominantly static loading and the design of dynamically loaded welded structures. The design of welded pressure equipment, aluminium alloy structures and reinforcing-steel welded joints is considered.

General Academic Regulations and Student Rules

The [General Academic Regulations \(G Regulations\)](#) and [General Student Rules](#) apply to all faculties and registered students of the University, as well as all prospective students who have accepted an offer of a place at the University of Pretoria. On registering for a programme, the student bears the responsibility of ensuring that they familiarise themselves with the General Academic Regulations applicable to their registration, as well as the relevant faculty-specific and programme-specific regulations and information as stipulated in the relevant yearbook. Ignorance concerning these regulations will not be accepted as an excuse for any transgression, or basis for an exception to any of the aforementioned regulations. The G Regulations are updated annually and may be amended after the publication of this information.

Regulations, degree requirements and information

The faculty regulations, information on and requirements for the degrees published here are subject to change and may be amended after the publication of this information.

University of Pretoria Programme Qualification Mix (PQM) verification project

The higher education sector has undergone an extensive alignment to the Higher Education Qualification Sub-

Framework (HEQSF) across all institutions in South Africa. In order to comply with the HEQSF, all institutions are legally required to participate in a national initiative led by regulatory bodies such as the Department of Higher Education and Training (DHET), the Council on Higher Education (CHE), and the South African Qualifications Authority (SAQA). The University of Pretoria is presently engaged in an ongoing effort to align its qualifications and programmes with the HEQSF criteria. Current and prospective students should take note that changes to UP qualification and programme names, may occur as a result of the HEQSF initiative. Students are advised to contact their faculties if they have any questions.