MASTER OF SCIENCE DEGREE IN MINERAL RESOURCE MANAGEMENT

Post graduate information

Introduction pack 2021

UNIVERSITY OF THE **FREE STATE**
UNIVERSITEIT VAN DIE **VRYSTAAT**
YUNIVESITHI YA **FREISTATA**

Developed with Industry Partners and Implemented by the University of the Free State

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1. Introduction

The MRM Masters of Science Degree is presented by the Geology Department in the Faculty of Natural and Agricultural Science at the University of the Free State and accredited by the Council for Higher Education.

The complexity of operating mines is increasing as the mining industry faces and increase in internal and external challenges. The external mining environment impacts mining throughput and profitability as the focus on safety, technology, environmental legislation and sustainable mining has a lasting effect on profitability and productivity. In a similar way, the internal mining factors are affected as each reserve is more challenging to mine as most high-grade ore is already mined out. As a result, cost control models and reduction in specialised staff are applied to curtail expenditure in an attempt to increase profitability.

The capability to manage the mining environment in a systemic manner increases the pressure for performance on operating mines. Working smarter has become crucial to ensure that businesses optimise the use of their resources, become more safety conscience, more productive and to remain cost-effective, while recognising the importance of sustainable mining now and in the future.

These drivers and demands are recognised by The University of the Free State and in partnership with industry partners developed the Mineral Resource Management (MRM) post graduate qualification to enable students to meet the challenges in mining. The MRM practice is based on the amalgamation of mining industry principles and improvement methodologies including, Theory of Constraints (TOC), Net present value (NPV) optimisation, Product Payability, Geometallurgy, Value chain optimisation, integration and synchronisation, and mining mineral and product throughput optimisation. MRM is a business practice involving the synchronisation and balancing of material flow and product payability attributes of the mining material flow.

2. The purpose of MRM

The MRM principles enable students to optimise ore-utilisation, product delivery and thus understand and optimise the profitability of the mining company. The purpose of the post graduate programme is to equip students with the:

a) Ability to identify the dependencies, interdependencies and variability that impact flow performance
b) Ability to use the TOC thinking logic processes
c) Exposing learners to the theory, case studies and discussions of the detail complexity of mining and other related disciplines that impact the mining value chain.

3. Admission requirements

The ideal candidates for enrolment in the course are individuals who whish understand and develop the knowledge of how to synchronise and improve the throughput of their organisation. Candidates include technical mining professionals, exploration, mine planning, scheduling and production management employees. Admission requirements include:

a) Any 4-year technical or scientific degree, or post graduate diploma, equivalent to NQF (National Qualifications Framework) level 8
b) At least 2 years relevant mining experience.
c) Recognition of Prior learning (RPL) is considered through the RPL office provided applicable mining industry related experience is sufficient.

4. Curriculum

The post graduate MRM qualification course structure is divided into four phases. The first-phase modules are mandatory for all candidates. In addition to the first-phase, post-graduate candidates have to complete at least 5 of the second-phase modules and two from phase 3, as well as a research essay in phase four. Students need to successfully complete all modules in Phase 1 as well as GLGD7913 in Phase 2 before registering for the research essay. In total the qualification comprises 204 credits in order to comply with the requirements of the degree.

Each module constitutes 120 notional hours which is aligned with 12 credits per module, 12 modules in total are required, which adds up to 144 credits. The mini-dissertation contributes

60 credits and ads to the total of 204 credits required. This total of 204 credits must be accumulated over a period of 2 years.

A typical module will comprise a period of self-study, followed by a workshop of two days, an assignment of ten days, as well as time to study for the exam. This will enable learners to study without having to leave their work place.

Table 1: The phases and modules of the MRM course

PHASE	MODULE DESCRIPTION	CREDITS
1	GLGA7913/23: Overview of business processes	12
	GLGA7933/43: Mineral Resource Management I Methodology	12
	GLGA7953/63: Applied Geology	12
	GLGA7973/83: Applied Mining	12
	GLGB7913/23: Applied Metallurgy	12
2	GLGC7913/23: MRM Implementation Practices	12
	GLGC7933/43: MRM Information Practices	12
	GLGC7953/63: MRM Organisational Change Practices	12
	GLGC7973/83: Virtual Mining Simulation and Optimisation	12
	GLGD7913/23: Mineral Resource Management II Advanced	12
	GLGC7933/43: Geological Modelling and Applied Geo-statistics	12
3	GLGE7913/23: Capita Selecta	12
	GLGE7933/43: Mining Throughput Accounting and Modelling	12
	GLGE7953/63: Mineral Resource Management Risk Practices	12
	GLGE7973/83: Modern Mining Supply Chain Principles	12
4	GLGD7910: MRM Research mini-dissertation	60

4.1 Delivery of MRM modules

The purpose of the workshops is to bring the candidates from the different backgrounds and functional areas together to discuss the work material and evaluate case studies. Two-day or three-day workshops will be conducted for some of the modules, at a suitable venue in Pretoria. Students attend classes in Pretoria for a full week per semester on consecutive days to accommodate working individuals. Classes are also presented online where more frequent contact sessions are applicable

4.2 The modules of this degree

GLGA7913/23: Overview of geology, mining, metallurgy and business processes: The objective is to introduce learners to the different functional disciplines through an overview of the important principles MRM in strategic, tactical and operational environments, each in the different functional areas.

GLGA7933/43: Mineral Resource Management I (Methodology): Highlights the principles and methodology of MRM through the identification and quantification of process variables. The focus is on the development of a business process concept with emphasis on product delivery, cost, income and market demand for the strategic, tactical and operational environments.

GLGA7953/63: Applied Geology: Enables students to understand and identify the influence of geological variables in the MRM environment in terms of the exploitation needs in the long-term and production environments. To enable the learner to determine and quantify variables pertaining to ore and ore- body morphology that has a critical influence on product delivery and profit.

GLGA7973/83: Applied Mining: Includes the application of variables and condition-driven standards in mine planning, scheduling and production management and control. Methods to determine the influence of "run-of-mine" quality on plant efficiency and product delivery. Included are the effects of maintenance performance and strategy in terms of condition-driven standards.

GLGB7913/23: Applied Metallurgy: The influence of plant condition and standards on the long-term and production environments, with particular focus on product range, will be examined using MRM principles.

GLGC7913/23: MRM Implementation Practices The applicability of project management as a major critical performance area in sustainable MRM will be examined and discussed. The module will emphasise the practical application of TOC thinking processes in structuring projects on how to deal with the challenges in implementing MRM in a mining operation.

GLGC7933/43: MRM Information Practices: This module investigates the availability of flow of information as an important component for sustainable MRM practices. This module will examine all the key elements of data structures and digitisation applications in the dawn of the fourth industrial revolution.

GLGC7953/63: MRM Organisational Change Practices: This module equips learners to understand the broad change management issues applicable when implementing MRM. The learner will be enabled to identify critical performance areas of change management, to design a basic change management strategy and learn how to execute that strategy.

GLGC7973/83: Virtual Mining Simulation and Optimisation: This module covers the design of a cost and production simulation model based on the total production process. Strategic, tactical and operational planning and budgeting will be addressed in terms of the variables and condition-driven standards, as well as the application of the model in an operational management and control environment.

GLGD7913/23: Mineral Resource Management II: This module equips the learner to identify the critical business process variables through evaluation of a production process and to design and implement suitable business changes to enhance value. To evaluate the influence on final product and production cost in the production process.

GLGC7933/43: Geological Modelling and Applied Geo-statistics: Understanding the role of geo-statistics in Mineral Resource Management and how it is used to determine optimum ore-utilisation and product delivery is imperative. Geo-statistical approaches can also be applied strategically to optimise ore-utilisation and maximise product delivery in the long-term.

GLGE7933/43: Mining Throughput Accounting and Modelling: The learner will understand how to calculate and make operational financial decisions that guarantee/deliver the required financial returns. This will create a relevant operational financial decision model which can be calculated in to a net profit, with some basic simulation scenarios for investment ranking.

GLGE7953/63: Mineral Resource Management Risk Practices: Application of risk management principles as applied to the minerals industry in terms of Health, Safety and the Environment. Responsibilities of owners, employers and suppliers will be highlighted. The learner will further be exposed to Risk Management Principals that could ensure a safe and healthy working environment.

GLGE7973/83: Modern Mining Supply Chain Principles: To obtain an overview of the traditional and MRM-adjusted supply chain principles and mining value and supply chain. Optimisation is done through systems and business process integration, internal and external collaborative planning and studying of the interlinked nature of downstream processes with the ore characteristics and what can be done about it.

GLGD7910: Research Dissertation: The subject of the research essay will be chosen in consultation with the course co-ordinator. The candidate must carry out a research task under supervision and present a research essay.

4.3 Student evaluation

Evaluation is affected by examination and/or assignments. Learners will be expected to do either a written or an oral examination or hand in an extended assignment for examination purposes. Open-book examinations will be taken. Some of the technical modules will require of the learner to be able to operate a programme and if the learner is already conversant with the program, to produce an application-based project in the MRM sphere.

Exams may be written in Bloemfontein (no exam fees applicable) or at a more convenient UFS external venue for a fee of R570.00.

4.4 Partnerships with industry professionals as lecturers

The MRM degree makes use of industry professionals (Table 2) to ensure that the content is relevant and that lecturers have the maximum value to add to each module taught.

Table 2: Lecturers partnered with for the MRM degree

Lecturer	**Short CV**
Arrie van Niekerk	Arrie van Niekerk obtained his B.Eng (Metal) from the University of Pretoria in 1978. He has been the project leader for the implementation of TOC in more than 60 mines and 15 manufacturing companies in South Africa. He has 15 years practical experience in his field and has developed unique solution for enhanced production flow in mining.
Dr Christina Dohm	Dr Christina Dohm has 37 years' experience in the mining industry. She has been involved in Mineral Resource Management, Mineral Resource Evaluation & Classification, Independent reviews and the Corporate Governance associated with Competent Persons Reports and Mining Operations and Projects worldwide. She has been a lecturer for the past four decades at various South African universities and continued lecturing and supervising post-graduate students in Geostatistics and MRM since her retirement form Anglo American at the end of 2015.
Ettienne Bergh	Ettienne completed his studies in industrial engineering at UNISA and has 14 years industry experience in strategic and tactical support in MRM and mine planning. He has been a manager of multi-disciplinary teams supplying MRM services to mining

	operations with various operational research & productivity studies in support to ground level & tactical improvement initiatives in simulation modelling and systems and process analyses.
Dr. Herman Prinsloo	Dr Herman Prinsloo has a Doctor of Philosophy (PhD) Field of Study Cognitive Science from the North-West University, he has over 15 years' experience in value realisation, organisational change management, continuous Business Improvement (CBI) and Training. He focuses mainly on solving business problems by inventively tweaking people interaction and processes in a business - results are usually instantaneous and measurable. He has worked on projects in 22 countries and has been a lecturer for the MRM program since 2007.
Albert Venter	over 10 years industry experience as a Metallurgical and processing engineer, he has extensive experience in the research and development sectors in mining operations. Albert is currently the technical director of CorMet Mineral processing and has extensive knowledge in dry and wet processing across a wide range of commodities. He has previously completed the MSc MRM degree as well as a Master's degree in Metallurgy
Michelle Dimmick-Touw	Michelle Dimmick-Touw has completed the MSc MRM degree at the UFS and has a Masters degree in Education focusing on open and distance learning. She has 14 years international industry experience in management and technical geological roles in various commodities. She has been a part of integrated mentoring programs which identify and develop the potential within individuals.
Philip Viljoen	Managing Director at RuZults Education, Philip has taught and developed people in Theory of Constraints thinking and applications throughout Southern Africa. He practises as educator, coach and mentor to cause people to think and then act through seeing their potential, developing their vision and supporting them to exceed. His clients get rapid results through unrelenting focus on maximising flow. He has been part of Dr. Eli Goldratt's inner circle for many years and uses the Theory of Constraints as the basis of his thinking and practise.
Prof Krige Visser	Prof Krige Visser is a professor with the Graduate School of Technology Management at the University of Pretoria. He has published 23 papers in academic journals and presented more than 30 papers at international conferences. He is registered as a professional engineer (ECSA) and is a council member of the Southern African Asset Management Association. His research interests are maintenance management, reliability management and physical asset management. He has over 31 years of industry experience

Tumelo Diale	Mr Tumelo Diale is currently a doctor philosophy candidate with his field of study in finance, he completed a of Masters of Management in Finance & Investments from the University of the Witwatersrand as well as the Masters in mineral resource management form the university of the Free State. He has 9 years of experience in the South African mining sector.

5. Cost of the course

A complete breakdown of the costs of the course are obtainable from the Senior Assistant Officer: Charlene van der Vyver E-mail: vandervyverc@ufs.ac.za Tel: 051 401 2393.

6. Contact information

Should you have any queries regarding the MRM program please contact the members below.

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