



Faculty of Engineering and the Built Environment,
University of Cape Town

Master of Philosophy

SPECIALISING IN SUSTAINABLE MINERAL RESOURCE DEVELOPMENT

A new trans-disciplinary and inter-institutional Master of Philosophy (MPhil) Degree, offered through the Minerals to Metals Research Initiative within the Department of Chemical Engineering at UCT

Preamble

Mining in Africa, as in the rest of the world, has changed from simply balancing production targets with cost control to a complex set of interrelationships including safety, health, the environment, sustainable development and proactive stakeholder management. This programme is aimed at providing an interdisciplinary postgraduate qualification that highlights the critical factors of sustainable development in the context of mining and minerals processing in Africa; including an understanding of, and a sensitivity and progressive approach to, managing and interacting with communities, environmental challenges, safety cultures, health-related issues and regulatory frameworks.

Programme Description

This is a two-year Master of Philosophy (MPhil) Degree, offered by the Faculty of Engineering and the Built Environment at the University of Cape Town, through the Department of Chemical Engineering, and accredited by the Higher Education Quality Committee (HEQC) of South Africa. Candidates shall be required to complete advanced study by coursework with a total value of 60 credits, and a research dissertation with a value of 120 credits.

This programme has been developed as part of the Education for Sustainable Development in Africa (ESDA) project of the United Nations University Institute for Sustainability and Peace (UNU-ISP). It is to be delivered on a decentralized basis by two African universities (University of Cape Town-Cape Town and University of Zambia-Lusaka) in partnership with other South African and Japanese universities, and the United Nations University, based upon a common set of course instructions.

Objectives

This MPhil degree aims to educate and train graduates who can develop knowledge at an advanced level in and around the African mining industry, through research. In particular, it aims to:

- Impart a high-level understanding of, and a sensitivity and progressive approach to, the critical factors of sustainable development in the context of mining and minerals processing in Africa.
- Develop an appreciation of the inter-relationships between safety, health, the environment, economic development and proactive stakeholder management, and the concomitant integration of technical skills, ethics and global citizenship.
- Promote experimentation with interdisciplinary and systemic approaches to environmental protection and socio-economic development in the context of geo-extractive industries in Africa.

Delivery

Core courses will be delivered in blocks of approximately one to two weeks each within the first year of study, with attendance by the entire cohort of students from the two universities involved. Course assignments will be presented via structured webinar (seminars delivered via the world-wide web) sessions, and contact with the students will be maintained via the internet and e-mail. The research project will account for 67% of the total course credits for the Masters degree, and will be undertaken within the second year of study, through the Department of Chemical Engineering. Cross-disciplinary research will be promoted through the joint supervision of student dissertations across faculties and universities.

Course Description	Convening Institute	Credits
Core Courses		
Sustainable Development	Sustainability Institute, University of Stellenbosch	16
Strategic Social Engagement Practice	Graduate School of Business, University of Cape Town	16
Environmental Stewardship in Mining & Minerals Beneficiation	School of Mines, University of Zambia	12
Research Communication and Methodology	Department of Chemical Engineering, University of Cape Town	16
Sustainable Development in Africa Internship	Department of Chemical Engineering, University of Cape Town	0
Dissertation	Department of Chemical Engineering, University of Cape Town	120

In accordance with the HEQF model, 10 hours is equivalent to 1 credit, with contact/lecture time accounting for approximately 1/5 of total time.

Admission Requirements and Procedures

This programme targets graduates from across a spectrum of disciplines, who have an interest in pursuing or advancing their careers in the field of mining and minerals beneficiation as professionals in a variety of areas e.g. geologists, engineers, economists, planners, strategists, lawyers, regulators, health professionals, safety specialists, environmental officers, social scientists, etc.

The basic entry requirement is a four-year Bachelor's degree or an Honours degree in any relevant field. HND (Higher National Diploma) or its equivalent embodying relevant specialization will be considered as a basis for entry, subject to appropriate experience. The number of students accepted into the programme in any year will be restricted by the resource capacity of the programme. Selection will be based on an applicant's academic record; the duration, level and relevant work experience; and the availability of a suitable programme and research project supervisor. In keeping with the inter- and cross-disciplinary nature of this programme, selection will also be aimed at promoting diversity amongst the students in terms of fields of study, expertise and/or experience.

In order to be accepted onto this programme, candidates are required to submit a 1000 word statement of interest in the Masters programme, together with a CV, to the course convener Professor Harro von Blottnitz (harro.vonblottnitz@uct.ac.za). This statement should include a motivation for attending the course and a short statement on the area(s) the candidate is considering for the research dissertation. Further information and procedures for formal application are available from the programme administrator, Mrs Barbara Andersen (barbara.andersen@uct.ac.za).

Applications close on 31 October 2014.

Programme Fees

Total cost for the 2015/2016 two-year programme is R105 500.00. This amount is inclusive of all course fees and accommodation costs whilst attending the block courses at the Sustainability Institute in Stellenbosch, the Graduate School of Business in Cape Town and the School of Mines in Zambia. Transport to and from these venues will be to the candidate's own cost. The programme is expecting to offer a limited number of scholarships to prospective students who can make a case on the basis of merit and need

ADDENDUM 1: COURSE MODULES

Sustainable Development

This is an existing Masters level course convened by the Sustainability Institute at the University of Stellenbosch in South Africa. The course lecturers are Professor Mark Swilling and Eve Anneck. The course combines classroom work, a group project for completion during the week, a written assignment, personal reflection, and practical involvement in local community projects. A course pack is provided prior to the course. A written assignment must be completed within 6-8 weeks after the course. There is no examination.

Rationale

This course focuses on the rise to global prominence of the challenge of sustainability in general and sustainable development in particular. Public policy debates at the global levels of governance are increasingly focussing on the challenges posed by natural resource limits to the ways production and consumption are currently structured and managed within a world that is sharply divided between the rich (located mainly in the north) and poor (located mainly in the south). The challenge facing the world today is not just about the redistribution of resources to ensure greater levels of social equity, but also about how to reorganise the extraction, use and disposal of those resources in order to ensure longer-term survival of the eco-systems that sustain all life. This course introduces participants to the historical evolution of the sustainable development paradigm, various theories of sustainability, the changing nature of the global economy, and practical applications at the global, African and local levels.

Aim

This course will be the foundation stone of the entire programme. It will provide course participants with an overview of the most significant global environmental, social and economic challenges that face humankind, and an insight into the solutions suggested by the universal commitment to sustainable development. Course participants will be able to recognise, understand and apply the divergent interpretations of sustainable development that currently exist. Three questions will guide the lectures and discussions:

- What does sustainability - and sustainable development in particular - mean?
- What is the relationship between inequality and unsustainability? Or, alternatively, what is the relationship between strategies to reduce inequality (via poverty eradication for the poor and consumption reduction for the rich) and sustainable development?
- What is the relationship between human life and all life forms and how has this relationship evolved over time?

The aim of the course is to make students comprehend different approaches to sustainable development and apply them to different interpretations of specific developmental contexts.

Learning Outcomes

At the end of the course a student is expected to:

- Understand the rise to global prominence of the challenge of sustainability in general and sustainable development in particular;
- Understand public policies and development strategy challenges posed by natural resource limits to the ways production and consumption are currently structured and managed within a world that is sharply divided between the rich (located mainly in the north) and the poor (located mainly in the south);
- Understand the historical evolution of the sustainable development paradigm, various theories of sustainability, the changing nature of the global economy, and practical applications at the global, African and local levels (including a case study of South Africa's National Framework for Sustainable Development).

Course Content

- A review of the most important environmental problems, such as climate change, waste and pollution, biodiversity destruction, and the general contradiction between resource use and carrying capacity.
- A review of the most significant social challenges, including demographic change and expansion, pandemics, poverty, endemic violence, migration and urbanisation.
- A review of the key global economic trends that currently determine and shape the dynamics of national and local economies.
- An introduction to the history of, and different approaches to, the notion of sustainable development.
- Case studies of sustainable development in practice at the policy and project levels.

Strategic Social Engagement Practice

This course will be convened by the Corporate Learning department at the UCT Graduate School of Business (GSB). The course lecturers include Mrs. Elspeth Donovan, A/Prof Chris Breen and A/Prof Ralph Hamman. The course will be delivered largely through lectures, interactive sessions, field visits and group work, and will be followed by a project task in which each student will be required to apply the tools and practices developed in the course into their daily work practice.

Rationale

One implication of environmental change or resource scarcity is the increasing likelihood of conflict among people or nations. Thus it becomes imperative to understand and be able to engage with complex challenges of environmental, social and economic that arises from the global call for a more sustainable future. In this course students will comprehend the principles of, and be able to develop and implement, strategic social engagement programmes and practices.

Aim

The aim of the course is to enable students to:

- Make sense of the social and environmental context of an organisation;

- Understand the mutual interaction between, and the impact on, the organisation and its social and environmental context;
- Engage with and manage the relationships between an organisation and the communities and other social partners that populate its context;
- Develop and implement strategic social engagement programmes and practices.

Learning Outcomes

After the course, a student will be able to demonstrate the ability to:

- Effectively communicate the strategic importance of social and environmental engagement;
- Describe the key concepts required to construct a framework for engaging with and managing stakeholder and social partner relationships; and
- Be effective at assessing the impact of social development initiatives

Course content

- *Community and Social Partner Assessment*: developing contextual and environmental awareness; stakeholder and social partner analysis; issue identification and surfacing; dealing with wicked problems.
- *Community and Social Partners and the Communication Process*: the communication process; communicating technical, social, political risk and crises issues and opportunities; information management and written material; working with the media.
- *Engaging Communities and Social Partners*: Dealing with co-operative and non-cooperative stakeholders and social partners; Developing trust and dialogue skills
- *Developing and Implementing Strategic Engagement Strategies and programmes*: scenario-thinking and back-casting; strategy as practice; management and development of strategic partnerships

Environmental Stewardship in Mining & Minerals Beneficiation

This is a new course, to be convened by the Zambian School of Mines at the University of Zambia, and to be delivered jointly with the Department of Chemical Engineering at the University of Cape Town. Key lecturers include Dr Jewette Masinja (UNZA), Professor Stephen Simukanga (UNZA), Professor Sue Harrison (UCT), A/Prof Harro von Blottnitz (UCT) and Dr Jenny Broadhurst (UCT). This course will provide exposure to the mining world and will offer students the opportunity to conduct case studies on real mine sites. The course will be delivered over a five day period, which will be followed by an examination. Students will also be required to complete an assignment within 6-8 weeks of attendance.

Rationale

Despite the apparent commitment to improving its environmental performance, the mining and mineral industry still suffers from the same negative image that it had in the early 20th century, and many mining companies continue to find themselves embroiled in environmental controversies which threaten their license to operate and their access to natural capital. Natural resources are also becoming more valued and as a result the cost of using these resources is increasing dramatically and legislation governing their protection becoming more prolific and stringent. An understanding of the environmental challenges of

particular relevance to mining and minerals beneficiation operations, and their broader significance in terms of the sustainable development of mineral resources, is cardinal

Aim

The course will focus on environmental challenges of particular relevance to the mineral industry, with emphasis on the relationship between mining and minerals beneficiation activities and environmental impact categories; the relative significance of these impacts from a local and global perspective; and their inter-related nature.

Course content

- *Overview of Relevant Environmental Issues*: land use issues; solid waste management; noise/air pollution; effluent/water management/AMD; biodiversity conservation; global warming/climate change; socio-economic considerations
- *Principles and Criteria for Environmentally Conscious Development of Mineral Resource*: cradle to grave mine design; cleaner production; eco-efficiency/industrial ecology; material stewardship; carbon neutrality
- *Environmental Legislation and Guidelines*, relevant international protocols; examples of key elements of national mining legislation in developed and developing nations (mining policy, mining code, provisions of environmental management)
- *Environmental Practices and Technological Innovations*, process water treatment and recycling; noise and air pollution control; solid waste management (including downstream application); AMD management and prevention; operation, closure and rehabilitation of mine sites (including cost provision); alternative energy sources and efficient utilization
- *Environmental Measurement and Control*, monitoring and control of biodiversity, noise/air pollution, water pollution, solid waste disposal, socio-economic impact
- *Environmental Assessment, Auditing and Management Framework*, environmental impact assessment; strategic environmental assessment; life cycle analysis; ISO 1400/auditing/EMS; environmental economics

Research Communication and Methodology

This course is convened by the Department of Chemical Engineering at the University of Cape Town. The lecturers are Professor Susan Harrison and Dr Rob van Hille. The course is delivered largely through lectures, tutorials and seminars, with reading assignments, group work, and projects forming a core part of the learning environment. This course will be delivered in discrete modules which are integrated into the overall course programme.

Aim

The aim of this course is to provide postgraduate students with competency to execute meaningful research in a structured way, to critically analyse the results of this research and to communicate these results effectively. To achieve this, the course topics include research philosophy; research planning, hypothesis development and research methodology; literature review skills; research ethics; research communication; structuring, writing and presentation of research outputs.

Learning Outcomes

At the end of the course a student expected to:

- Acquire competency in executing meaningful research in a structured way and critically analyze the results of the research;
- Be able to communicate research results effectively.
- Acquire Literature analysis, relevant literature sources, hypothesis development skills, research design skills

Course Content

- Research philosophy
- Research planning
- Hypothesis development and research methodology
- Literature review skills
- Research ethics
- Research communication and related technical skills
- Experimental practice
- Structuring, writing and presentation of research outputs

Sustainable Development in Africa Internship

This will be a new non-credit bearing course, listed with the postgraduate course offers of the Dean of the Faculty of Engineering and the Built Environment. As an academic offering, it is grounded in the realizations that sustainable development i) requires professionals to be able to negotiate disciplinary truth boundaries so as to minimize externalization of costs and damages to 3rd parties or future generations; and ii) requires an understanding of the complexity of coupled social-ecological systems, which can only partly be learnt in the classroom.

Aim

- To facilitate field-based inter-disciplinary learning especially through on-site structured engagements with problem-solving approaches in the actual developmental setting of the host organization;
- To provide an opportunity to experience possible career options in the area of sustainable development;
- To make a service contribution that will not only be useful to the host organization, but also contribute to the university's social responsiveness objectives.

Course Structure

The student will select, with the aid of the course convener, a placement with any one of the listed internship host organizations or suitable alternative. The specific content and aims of the internship, tailored to the needs of the student relative to the theoretical

demands of the student's academic programme, will be recorded in an MOU between the student, the host and the course convener ahead of the start of the internship. The student will keep a logbook and will complete an internship report for the host and for submission to the University. The academic time spent on the course, incl. the academic preparation, preparation of the report and theoretical reflections (as recorded in the logbook) must be equivalent to approximately 80 hours of student time.

ADDENDUM 2: PROVISIONAL PROGRAMME SCHEDULE FOR 2015/2016

Period	Component	Details		
		Schedule	Location	Activities
<u>Year 1</u> March 2015	Orientation	Day 1 (Fri afternoon)	Department of Chemical Engineering, UCT	Welcome function and course introduction by course convener
	Coursework Block 1	Day 2 (Sat)	Department of Chemical Engineering, UCT	Research Communication & Methodology course: Module 1a - Critical analysis of the literature; structuring, writing and presenting for academic purposes
		Day 3 (Sun)	free	
		Days 4-9 (Mon - Sat)	Sustainability Institute, Lynedoch, Stellenbosch	Sustainable Development course
		Day 3 (Sun)	free	
		Day 11 (Mon)	Department of Chemical Engineering, UCT	Research Communication & Methodology course: Module 1b - Critical analysis of the literature: case study example (based on literature from the Sustainable Development course)
	April - May 2015	Off-site*/ Self study	<ul style="list-style-type: none"> • Written assignment for the Sustainable Development course • Research Communication & Methodology assignment on critical analysis of the literature, with feedback to peers and lecturers in structured webinars 	
June 2015	Coursework Block 2	Days 1-5 (Mon - Fri)	Graduate School of Business, Breakwater campus, UCT	Strategic Social Engagement Practice course
		Day 6 (Sat)	Department of Chemical Engineering, UCT	Research Communication & Methodology course: Module 2a - The research method: planning, design, and execution of research

		Day 7 (Sun)	free	
		Day 8-9 (Mon - Tues)	Department of Chemical Engineering, UCT	Research Communication & Methodology course: Module 2b - Developing a hypothesis; writing the research proposal; assignment of research projects and supervisors
July-September 2015	Off-site*/Self study period	<ul style="list-style-type: none"> • Complete assignment for Strategic Social Engagement Practice course • Literature review and development of hypothesis and key questions for research project - to be presented in structured webinars 		
October 2015	Coursework Block 3	Day 1-8 (Sat Sat)	University of Zambia, School of Mines, Lusaka	Environmental Stewardship in Mining and Minerals Beneficiation course
		Day 9-10 (Sun-Mon)		Research Communication & Methodology: Module 3-review and integration of learning from previous coursework; planning and writing your research paper
November-December 2015	Off-site*/Self study period	<ul style="list-style-type: none"> • Complete assignment for Environmental Stewardship course • Complete project proposals - to be presented in structured webinars 		
<u>Year 2</u> January - December 2016	<ul style="list-style-type: none"> • Research dissertation • Project work and research dissertation-progress updates to be provided in regular webinar sessions 			

** working students only, full-time students will be required to work towards their research dissertations during these periods*