

# MSc Solid Waste and Resource Management (Full-time/Part-time) – E511

## 1. Aims and objectives

Solid waste has been identified as a major problem that has reached proportions requiring radical measures. Increase in generation rate and change in the quality of solid waste have been observed together with inadequate legislations and high costs for collection and disposal. It is therefore, crucial to adopt an extensive approach to develop a framework for solid waste management. This covers social, economic, technology, political and administrative elements.

The programme is intended to provide an in-depth knowledge of solid waste management with a focus on management systems and treatment methods related to environmental policies. Moreover, principles of solid waste management, design of treatment plants, recycling methods, environmental economics, ecological relevance and sustainable production will also be considered.

The programme will cover Waste Management, Environmental Economics and Policies as well as Environmental Technologies and Processing.

## 2. General Entry Requirements

Successful completion of an undergraduate degree with

- at least a Second Class or 50 % which ever applicable or
- a GPA not less than 2.50 out of 4, or equivalent, from a recognized higher education institution.

**OR** alternative qualifications acceptable to the University of Mauritius.

## 3. Programme Requirements

Preference will be given to holders of an engineering or science degree and to candidates having at least two (2) years of relevant work experience.

## 4. Programme Requirements – Special Cases

The following may be deemed to have satisfied the General and Programme requirements for admission:

- (i) Applicants who do not satisfy any of the requirements as per Regulations 2 and 3 above but who submit satisfactory evidence of having passed examinations which are deemed by the Senate to be equivalent to any of those listed.
- (ii) Applicants who do not satisfy any of the requirements as per Regulations 2 and 3 above but who in the opinion of Senate submit satisfactory evidence of the capacity and attainments requisite to enable them to pursue the programme proposed.
- (iii) Applicants who hold a full practising professional qualification obtained by examination.

## 5. Programme Duration

The Programme will be offered on a full-time basis, and part-time basis. The duration of the Post Graduate Programme should normally not exceed 2 years (4 semesters) on full-time and not exceed 4 years (8 semesters) on part-time.

Full-time	Normal	Maximum
Master's Degree (FT):	2 Semesters	4 Semesters
Postgraduate Diploma (FT):	2 Semesters	4 Semesters
Postgraduate Certificate (FT):	1 Semesters	2 Semesters

	<b>Part-time</b>	<b>Normal</b>	<b>Maximum</b>
Master's Degree (PT):		4 Semesters	8 Semesters
Postgraduate Diploma (PT):		4 Semesters	8 Semesters
Postgraduate Certificate (PT):	2 Semesters	4 Semesters	

## 6. Credits per Semester:

Minimum 3 credits per semester and Maximum 24 credits per semester subject to Regulation 5.

## 7. Minimum credits Required for Awards

Master's Degree:	36
Postgraduate Diploma:	24
Postgraduate Certificate:	12

Breakdown as follows:

	<b>Core Taught Modules (Min)</b>	<b>Project</b>	<b>Electives/ Optional Modules</b>
<b>Master's Degree:</b>	<b>21 credits</b>	<b>9 credits</b>	<b>6 credits</b>
Postgraduate Diploma:	21 credits		3 credits
Postgraduate Certificate:	12 credits		

## 8. Assessment

Students are required to register for modules which they intend to follow in a given semester on date(s) specified by the Faculty. Each module will carry 100 marks and will be assessed as follows (unless otherwise specified):

The continuous assessment will count for 30% to 40% of the overall percentage marks of the modules unless otherwise specified.

Continuous assessment may be based on laboratory work, seminars and should include at least two (2) assignments/tests per semester/year per module.

An overall total of 40% for combined continuous assessment and written examination components would be required to pass the module, without minimum thresholds within the individual continuous assessment and written examination.

All modules carry equal weighting.

The Project carries 9 credits

### **Submission Deadlines for Dissertation:**

#### **Full-time**

Project will start on early December

First Draft: End of June of Final Year.

Final Copy: Last working day of July of Final Year.

#### **Part-time**

Project will start on January of second year

First Draft: End of July of Final Year.

Final Copy: Last working day of August of Final Year.

## 9. Plan of study

Students are required to submit at the end of Semester 1 a Plan of Study for their whole Programme of Studies, indicating the list of elective modules and in which semester each of them will be taken.

The University reserves the right not to offer a given elective module if the critical number of students is not attained and/or for reasons of resource constraints.

## 10. Important Note

The rules as stipulated in this Programme Structure and Outline Syllabus will replace all other rules and regulations found in previous Programme Structures.

## 11. List of Modules

<b>Code</b>	<b>Module Name</b>	<b>Hrs/Wk L+P</b>	<b>Credits</b>
<b><u>CORE MODULES</u></b>			
CHE 6101	Introduction to Solid Waste Management	3+0	3
CHE 6102	Recycling and Resource Management	3+0	3
CHE 6103	Mechanical, Biological and Thermal Waste Treatment	3+0	3
CHE 6201	Hazardous Waste Management	3+0	3
CHE 6202	Waste Management Systems	3+0	3
CHE 6203	Final Disposal/ Landfilling in DC	3+0	3
ENGG 6202	Research Methods	3+0	3
<b><u>PROJECT</u></b>			
CHE 6000	Research Project	-	9
<b><u>ELECTIVES</u></b>			
CHE 6104	International Environmental Policy	3+0	3
CHE 6205	Environmental Economics	3+0	3
CHE 6106	Mining Waste Management	3+0	3
CHE 6204	Sustainable Production Technologies	3+0	3
CHE 6105	Environmental Management Systems	3+0	3
CHE 6206	Special Waste Management	3+0	3

**Students have to complete ALL core taught modules, the project work and ANY two (2) electives.**

## 12. Programme Plan – Msc Solid Waste and Resource Management

### FULL-TIME:

YEAR 1							
Semester 1				Semester 2			
Code	Module Name	Hrs/Wk L+P	Credits	Code	Module Name	Hrs/Wk L+P	Credits
CHE 6101	Introduction to Solid Waste Management	3+0	3	CHE 6201	Hazardous Waste Management	3+0	3
CHE 6102	Recycling and Resource Management	3+0	3	CHE 6202	Waste Management Systems	3+0	3
CHE 6103	Mechanical, Biological and Thermal Waste Treatment	3+0	3	CHE 6203	Final Disposal / Landfilling in DC	3+0	3
ENGG 6202	Research Methods	3+0	3	CHE 6000	Research Project	9 + 0	9
<b>ELECTIVES</b>				<b>ELECTIVES</b>			
CHE 6104	International Environmental Policy	3+0	3	CHE 6204	Sustainable Production Technologies	3+0	3
CHE 6105	Environmental Management Systems	3+0	3	CHE 6205	Environmental Economics	3+0	3
CHE 6106	Mining Waste Management	3+0	3	CHE 6206	Special waste Management	3+0	3

### PART-TIME:

YEAR 1							
Semester 1				Semester 2			
Code	Module Name	Hrs/Wk L+P	Credits	Code	Module Name	Hrs/Wk L+P	Credits
CHE 6101	Introduction to Solid Waste Management	3+0	3	CHE 6103	Mechanical, Biological and Thermal Waste Treatment	3+0	3
CHE 6102	Recycling and Resource Management	3+0	3	ENGG 6202	Research Methods	3+0	3
<b>ELECTIVES</b>				<b>ELECTIVES</b>			
CHE 6104	International Environmental Policy	3+0	3	CHE 6106	Mining Waste Management	3+0	3
CHE 6105	Environmental Management Systems	3+0	3			3+0	3

YEAR 2							
Semester 1				Semester 2			
Code	Module Name	Hrs/Wk L+P	Credits	Code	Module Name	Hrs/Wk L+P	Credits
CHE 6201	Hazardous Waste Management	3+0	3	CHE6203	Final Disposal / Landfilling in DC	3+0	3
CHE 6202	Waste management systems	3+0	3				
CHE 6000	Research Project	9 + 0	9				
<b>ELECTIVES</b>				<b>ELECTIVES</b>			
CHE 6204	Sustainable Production Technologies	3+0	3	CHE 6206	Special Waste Management	3+0	3
CHE 6205	Environment al Economics	3+0	3				

### NOTE:

Each module will consist of 45 contact hours (this includes lectures, tutorials, seminars, workshops, external visits, etc.). The total contact (taught) hours of the Programme therefore will be 405 hours. The Project will involve an equivalent of 180 working hours including direct supervision by a member of academic staff and/or an external supervisor.

### 13. Outline Syllabus

#### Core Modules

##### **CHE 6101 – INTRODUCTION TO SOLID WASTE MANAGEMENT**

Waste generation and composition, national and international regulations for waste, waste avoidance, collection and transport of waste, separate collection of recyclables, sorting of recyclables, recycling technologies for paper, glass, metal, plastic, biological treatment of waste, waste disposal, ecological indicator systems, principles of waste management (e.g. EU approach), polluter and producer pays principle, the precautionary principle, waste hierarchy, concept from cradle to grave.

##### **CHE 6102 - RECYCLING AND RESOURCE MANAGEMENT**

Material and energy flow management and analysis, influences of production and consumption, ecological and economically valuation of substances, assessment of sustainability of material flows, optimisation of material-, energy- and information flows, treatment technologies, design for recycling, upgrading and repair, recycling and reuse, engineering cost estimation, and regulatory/legal aspects of waste management are included, waste minimization, basic unit processes, processing, application and utilization of reclaimed products.

##### **CHE 6103 - MECHANICAL, BIOLOGICAL AND THERMAL WASTE TREATMENT**

Design limitations (waste quality and quantity), treatment process, biochemical reactions and microbial ecosystems, thermodynamic waste heat generation and effects on pathogen die-off, biological treatment: anaerobic digestion, composting and mechanical biological treatment, aerobic and anaerobic treatment of bio and green wastes, mechanical and biological treatment of residual waste (MBT), process design to maximize methane production, digester designs, biogas collection and utilization, biomass and biofuel production, thermal waste treatment technologies.

##### **ENGG 6202 - RESEARCH METHODS**

The Research Concept. The Research Process. Surveys and Sampling Design. The Choice of Analysis, review of basic statistics, regression analysis, analysis of variance, multiple regression, hypothesis testing, dummy variable in regression, one way ANOVA, theory and application of maximum likelihood methods.

##### **CHE 6201 - HAZARDOUS WASTE MANAGEMENT**

Hazardous waste treatment and disposal; hazardous waste identification, basic properties of hazardous waste, classification of hazardous waste, hazardous waste generation and characteristics, transportation and storage of hazardous waste, physical, chemical and biological treatment, thermal treatment and energy recovery, stabilisation and solidification and land disposal of hazardous waste, alternative hazardous waste management programs.

##### **CHE 6202 - WASTE MANAGEMENT SYSTEMS**

Planning of waste management systems (Costs, Aims, Basics), logistics, collection (Storage Systems), transport and transfer Stations (policy, economics, planning), identification of pollution prevention opportunities and implementation of proven methodology as defined by International Environmental Agencies (e.g. EPA), emphasis on economic evaluation of pollution prevention practices and investments for various manufacturing and post-consumer processes, monitoring.

##### **CHE 6203 - FINAL DISPOSAL/ LANDFILLING IN DC**

Landfill emissions, site requirements, landfill construction, monitoring, landfill technology and operation, siting and construction, design characteristics, life span, extraction of landfill gas – future energy production, operation and maintenance, emission control and treatment.

##### **CHE 6000 – RESEARCH PROJECT**

Project related to solid waste management and resource recovery.

## **Electives**

### **CHE 6104 - INTERNATIONAL ENVIRONMENTAL POLICY**

Methods and strategies for promoting solutions to global environmental problems, policymaking from the perspective of developed and developing countries, the United Nations system, international financial entities, and non-governmental interest groups, progress of international community, obstacles preventing effective international solutions, links between politics, policy and the environment, origins and evolution of different forms of environmental policy, different stages of the environmental policy process, study of academic research papers.

### **CHE 6105 - ENVIRONMENTAL MANAGEMENT SYSTEMS**

Integration of environmental issues on sustainability in businesses, key elements of the Eco-Management and Audit Scheme (EMAS) and ISO 14001, principles and elements of environmental management systems, environmental management and reporting, examples of Environmental Management System (EMS) manuals, developing a 'mock EMS manual' for an organisation developing and implementing an ISO14000 compliant EMS within an organisation.

### **CHE 6106 – MINING WASTE MANAGEMENT**

Methods for the Characterisation of Mining Waste, Risk Assessment of Mining Waste Facilities including Old/Abandoned Mining Waste Facilities, Review of Techniques for the Prevention and Abatement of Pollution Generated by Mining Wastes, Examples of Decision Support Tool for Minimising the Impact of the Mining Industry on the Environment.

### **CHE 6204 - SUSTAINABLE PRODUCTION TECHNOLOGIES**

Introduction to sustainable development and sustainable production, impact of production processes on the environment, sustainable production processes in the chemical, metal and ceramic industries, purpose and implementation of CDM/ JI, Kyoto Protocol, CDM Market, Investments, incentives, opportunities-financing, economics of CDM/ JI projects.

### **CHE 6205 – ENVIRONMENTAL ECONOMICS**

Internalising an externality, instruments of environmental policy, monetary valuation of environmental problems, basic economic principles to assist environmental analysis and management, implications of economic activity and development for environmental quality, and of the economic tools and frameworks, participatory method, cost-benefit analysis, multi-criteria assessment, sustainability Indicators (e.g. ecological footprints).

### **CHE 6206 - SPECIAL WASTE MANAGEMENT**

Introduction, definition of hazardous health care waste, infectious waste, genotoxic waste, waste sharps, biomedical waste – categories and composition, sources of health care wastes, hospital waste management, potential health hazards, legislation and policies on health care waste management, World Health Organization guidelines, industrial waste definition, industrial waste audit, industrial waste management, hospital and industrial wastes collection, treatment and disposal.

*April 2010*