Faculty of Science, Leiden University

and

Faculty of Applied Sciences, Delft University of Technology

Implementation Regulations

September 1st, 2011 till August 31st, 2012

Masters' Programme Industrial Ecology

Corresponding to the Course and Examination Regulations of the master's programme Industrial Ecology

Contents

Section 1 – General

Article 1.1 – Semesters and start of the study
The academic year is divided into two semesters. Students can start in the programme at two moments, at the beginning of the first semester or at the beginning of the second semester.

Article 1.2 – Admission Requirements

1. A bachelor's degree in any of the Natural Sciences, Engineering Sciences, or Social Sciences from an accredited university programme and comparable with three years of Dutch Academic Education. The application for admission shall be reviewed by the Board of Admissions.
2. For Dutch HBO students, the grade point average of the entire curriculum has to be 7.5 or higher.
3. The student has a demonstrable affinity with multi-disciplinary education and research by showing course modules, summer courses, internships, or other relevant experiences that are within the endterms of the bachelor's degree, or at least at sufficient academic level, but clearly outside the main field of the bachelor's degree.
4. The student has a demonstrable interest in the field of Industrial Ecology and can show in a motivation letter to the admission committee at least one relevant example of the relation between his/her bachelor's education or previous experience and an academic contribution to the field of Industrial Ecology.
5. Students from abroad must also show proficiency in English, to be demonstrated by IELTS, TOEFL or Cambridge Certificate of Proficiency in English with the levels as prescribed at www.mastersinleiden.nl.

Article 1.3 – Specialisations / special tracks
The master's programme does not offer any specialisations / special tracks.

Article 1.4 – Exit qualifications
The specific exit qualifications within the general objectives of the programme, as formulated in Article 2.1 and 2.2 of the Course and Examination Regulations, read as follows. Graduates from the master's programme Industrial Ecology will:

1. have a general knowledge of the main disciplines relevant to Industrial Ecology, i.e. environmental science, process technology, product design, economics and organisational management;
2. have a thorough knowledge of the Industrial Ecology field, including its theories and concepts, its methodologies and its object, the technosphere;
3. have a thorough knowledge of and insight into the main sustainability issues, their causes in society and the technosphere, the currently available Industrial Ecology solutions, their potential and limitations;
4. have an understanding of the societal sustainability debate regarding the three dimensions (people, planet, and profit) and the ability to contribute to this debate, relating Industrial Ecology expertise to input from the natural, technical, and social sciences;

5. have the ability to identify issues and to generate new solutions based on their knowledge of Industrial Ecology;
6. be capable of using, improving, and applying the methods, techniques and tools of Industrial Ecology, including systems analysis, life cycle assessment, substance and materials flow analysis, energy balances, input-output analysis, stakeholder analysis and involvement, transition management and system dynamics, agent based modelling, and the implementation, monitoring and management of innovation processes;
7. be able to contribute to the technological design of industrial systems, industrial processes and consumer products, aiming at environmental protection and sustainability, and to identify threats and opportunities of current and new processes for life cycle stages like the extraction of raw materials, production, consumption, and waste treatment;
8. have acquired general academic skills, including the usage of research methods and tools such as statistical data analysis, collecting and interpreting data, modelling techniques, critical application and evaluation of theories, concepts, and principles;
9. be capable of conceiving and conducting research in the multi-disciplinary field of Industrial Ecology;
10. be capable of analysing and synthesising information, including research results, and of presenting them using text, presentation techniques, and graphic tools to both specialist and non-specialist audiences.

Section 2 – Description of the master's programme

Article 2.1 - General
Industrial Ecology is an interdisciplinary scientific field aiming at analysing sustainability problems and designing and implementing solutions for such problems. Industrial Ecology field studies the technosphere, also known as the physical economy. In almost all cases, flows of energy and materials are the connection between economic activities and environmental problems. These energy and material flows are the core object of Industrial Ecology, as well as the technologies generating those flows and the socio-economic context driving technology development. The educational programme focuses on the analysis, design, and implementation of industrial systems on the analogy of ecological systems and with the least possible adverse sustainability impacts.
The master's programme Industrial Ecology consists of three parts, providing basic concepts and theories:

1. Natural Sciences of Industrial Ecology – Environmental science, Industrial Ecology analysis of technosphere systems and their relation with biosphere systems, in view of ecological sustainability, using tools such as Life Cycle Assessment, Material Flow Analysis, and ecological models.
2. Technical Sciences of Industrial Ecology – Design of technological systems, with a view on sustainable development, using tools from the realm of Design for Sustainability, Ecodesign, and Complex Adaptive Systems.
3. Social Sciences of Industrial Ecology – Implementation of socio-technological systems, among others eco-industrial parks, and implementation of sustainably sound industrial practice.

Article 2.2 - Overview of the two-year curriculum

1. Core Modules (54 EC)
2. Elective Modules (6 EC).
3. Interdisciplinary Project Groups (12 EC)
4. Specialisation Modules (12 EC)
5. Master's Thesis Research Project (36 EC)

Article 2.3 – Core modules
These form the central part of the programme and are compulsory for every student.

Code and Title	Level	EC
General Introduction to Industrial Ecology	500	6
Fundamentals of Systems, Data, Models and Computational Thinking	500	6
Analytical Methodologies and Tools	500	6
Social Systems – Policy and Management	500	6
Renewable Energy Systems	500	6
System Earth	500	6
Design of Sustainable Technological Systems	500	6
Sustainable Innovation and Social Change	500	6
Urban Environments and Infrastructures	500	6

Article 2.4 – Elective Module(s) (6 EC, level 400/500/600)

1. Elective modules have to be selected as a component within the first year of the programme, with a minimum of 6 ECTS. Elective Modules are at master education level, i.e. for Leiden University with a level 400 or higher, or for Delft University of Technology a course from a master's programme or comparable.
2. The content of the course has to be related to the field of Industrial Ecology and the choice for Elective Modules has to be approved by the Board of Examiners before the start of the course.
3. The Board of Examiners will provide a list, from which students can make their choice. Students that select courses from this list do not need individual approval.
4. Students can send a request to the Board of Examiners for courses that are not on the list. The Board of Examiners makes a decision within 20 working days following the submission of the individual request. The student will be notified of the board's decision as soon as possible.

The master's programme Industrial Ecology provides two elective course module as presented in the table below.

Code and Title	Level	ECTS
Capita Selecta Module	500	6
Advanced Course on LCA	600	4

Article 2.5 – Interdisciplinary Project Groups (12 EC)
In the second year, students join project groups in which they are trained to solve real-life Industrial Ecology problems, by integrating the knowledge and insights they have acquired from studying different disciplines. A description of end-terms and selection procedure will be presented in the study guide in advance.

Code and Title	Level	ECTS
Interdisciplinary Project Groups	600	12

Article 2.6 – Specialisation Modules (12 EC, level 400/500/600)
Specialisation Modules have to be selected as a component within the second year of the master's programme, with a minimum of 12 ECTS. The choice for Specialisation Modules has to be approved by the first examiner of the Master's Thesis Research Project and the Board of Examiners before the start of the course. Specialisation Modules are part of a master's programme, i.e. for Leiden University with a level 400 or higher, or i.e. for Delft University of Technology a course from a master's programme or comparable. The Board of Examiners makes a decision within 20 working days following the submission of the individual request. The student will be notified of the board's decision as soon as possible.

Article 2.7 – Master's Thesis Research (36 EC, level 600)
Students of the master's programme Industrial Ecology have to select, depending on their interest and background, a research topic in deliberation with staff members of

one or more of the research groups involved. Students has to work independently on a research project.

The Master's Thesis Research Project is composed of two modules:

Code and Title	Level	EC
Thesis Preparation Module	600	6
Thesis Research Project	600	30

Article 2.8 – Composition of the individual study programme

1. Each student shall propose an individual study programme (ISP) after having consulted with the study advisor. An ISP must satisfy the final terms as described in the Course and Examination Regulations (OER) and is subject to the approval by the Board of Examiners.
2. Each individual study programme must be submitted, preferably accompanied by a letter stating the reasons for taking the modules chosen, to the study advisor for approval by the Board of Examiners at last before the start of the semester in which the courses of the ISP will be taught.
3. Amendments to the individual study programme throughout the academic year are likewise subject to approval.

Article 2.9 – Approval of Elective Courses, Specialisation Courses and other individual adaptations of the study programme

The Board of Examiners makes a decision with regard to the students' Elective Courses, Specialisation Courses and other individual adaptations of the programme within 20 working days following the submission of the proposal.

Section 3 – Date of commencement

These regulations come into force on September 1st, 2011.
These regulations have been decreed by the Deans of the respective faculties together with the Course and Examination Regulations of the Master's Programme Industrial Ecology.