Annex 4 - IMETE Study Guide

International Master of Science in Environmental Technology and Engineering										Language of Education: English
1.1 University of Chemistry and Technology, Prague **BASIC introductory courses, 26 ECTS compulsory, 2 ECTS language elective, + 5 ECTS "transferable skills" – year course**										
Nr	**Code**	**Course Name**	**Lang**	**ECTS**	**Ref**	**MT1**	**Session (sem1/2/yr)**	**Contact hrs**	**Study hrs**	**Course information**
1	I001978	Environmental Microbiology	EN	4		1	1	42	112	This course gives the background for the application of biotechnology in environmental engineering. The key elements are: Biosphere formation, Microbial fueling, Microbial diversity and its analysis, Microbial ecology, Biogeochemical cycles, Biodegradation and bioremediation and Phylogenetic analysis
2	I001977	Environmental Engineering	EN	4		1	1	42	112	This course aims to describe the most important environmental technologies and their practical application including Remediation technologies, Integrated treatment technologies, Natural attenuation and enhanced attenuation, Monitoring and Control.
3	I001856	Wastewater Treatment	EN	5		1	1	56	140	The aim of the course is to build knowledge on the principles of wastewater treatment technologies. Wastewater characterization methods and the main wastewater treatment technologies based on chemical, physicochemical and biological processes are explained.
4	I001859	Waste Management and Treatment	EN	4		1	1	42	112	Providing skills in the field of waste collection, transport, processing, recycling or disposal, with special emphasize to solid waste – both municipal and industrial. The main aim of the course is to enlighten the state of the art in waste management and treatment technology, organizational and legislative developments and practices of handling solid wastes within the Czech Republic and Europe.

	I002081	Atmosphere Protection Technology	EN	3		1	1	28	84	The course provides the fundamental knowledge in nature of atmospheric pollution, types, effects and related issues. It involves the fundamentals of atmospheric chemicals and reactions, evolution of the earth's atmosphere interacting with the sun's spectra and radiation, major atmospheric pollution issues The course includes many practical examples and problems and practical exercises, presentations and field trips.
6	I002080	Sludge Management	EN	3		1	1	28	56	The aim of the Sludge Management course is to deliver basic knowledge about properties and optimal handling methods of sludge produced during wastewater treatment. It will be described the methods of sludge stabilization, hygienization, dewatering and final disposal or reuse. Emphasis is put on methods leading to minimization of sludge production and methods of energetic and material valorization of sludge.
7	I001980	Environmental Engineering-Laboratory	EN	3		1	1	56	84	Laboratory Course in Water Technology follows up the courses of Biological Wastewater Treatment, Anaerobic Digestion and Water Treatment. Students can apply their theoretical knowledge from these courses and will practice the basic methods of water and wastewater treatment in laboratory scale.
8	I001860	Elective project I	EN	3		1	1	21	84	Students are trained to apply theoretical knowledge to solve specific problems in the field of wastewater treatment, atmosphere protection technology, and waste management and treatment. The students should elaborate a projects based on real cases proposed by the industrial partners of IMETE. During the first part of the course (EP I), students will be guided to collect all necessary data describing the real case, perform literature survey on the problem and propose several alternative technical solutions. The solutions will be presented to the teachers and representatives of the industrial partners and the most promising one will be selected for further detail elaboration.

9	I002082	Communication and writing skills for engineers I	EN	2		1	1	18	56	This communication and writing skills course for engineering students is designed to introduce them to written and oral communications in Engineering. The course introduces them to documents produced in response to the context of the Engineering curriculum and/or issues related to it. Students will work on realistic contextualized tasks with the aim of developing communication strategies necessary to meet the academic and entry-level professional requirements in Engineering. In Prague the students will focus on writing skills, preparing scientific documents and project reports.
10	I001864	ELECTIVE Basics of Czech	EN	2		1	1	28	56	The aim of this course is to deliver basic knowledge about the Czech language. Familiar everyday expressions will be taught and frequently used phrases aimed at the satisfaction of needs of a specific type will be explained. Emphasis will be laid on topics such as: personal introduction, basic personal and family information, food and restaurants, shopping etc. The students will learn the way to ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she can do.
1.2 Stichting IHE Delft **Focus on water treatment, 30 ECTS compulsory, Consecutive courses of 3 weeks, Choice between 2 tracks, 2 ECTS language elective**										
Nr	**Code**	**Course Name**	**Lang**	**ECTS**	**Ref**	**MT1**	**Session (sem1/2/yr)**	**Contact hrs**	**Study hrs**	**Course information**
11	NEW	Environmental Process Technology	EN	5		1	2	60	140	To gain a better understanding of water and wastewater treatment the principles of mass balances, reaction kinetics and reactor design are discussed in environmental process technology (EPT). During this lecture, the following topics will be covered; (i) Mass balance analysis, (ii) Ideal batch reactors, (iii) Plug flow reactor, (iv) Stirred tank reactor, (v) Tracer responses in reactors, (vi) Continuous flow reactors with recycle, (vii) Thermodynamics of environmental processes, and (viii) Problem solving tutorials.
12		Elective project II	EN	2		1	2	14	60	Students will continue working on the case studies developed during Elective Project I (EP I). They will further

										elaborate on the technical solution proposed during EP I, i.e. they will work out the technical details and evaluate economical aspects of the solution. The outcome will be presented at a joint event, where the students will offer their project outcomes to the industrial partners, i.e. potential investors.
13		Communication and writing skills for engineers II	EN	3		1	2	30	84	In Delft, the students will deal with the planning and execution of a research project, the available scientific information sources, techniques for literature search, validity and reliability of information sources, critically reading and evaluating papers, experimental design, data collection, presenting results and research proposals through oral presentations and writing scientific publications. The students will be supervised in developing a research plan and starting up the literature review for a specific research project. Raising the awareness regarding the importance of social media/networking skills through targeted assignments
14		Field Trip	EN	5		1	2	120	140	In the International Field Trip the participants will be exposed to different international practises in the design, operation and management of water supply, wastewater, solid waste and urban civil infrastructure networks. The students will also do practical fieldwork to familiarize themselves with performing research on location, how to process real data, and how to apply the newly acquired knowledge to a practical situation.
Stichting IHE Delft15 ECTS elective water tracks										
15		***Track: "Ecotechnologies"***								
15.1		Water Quality Assessment and Monitoring	EN	5		1	2	60	140	This course offers the following subject matters: i) Fresh water quality and monitoring: natural water quality and water pollution; designing and optimization of water quality monitoring programmes; physico-chemical and biological water quality assessment; groundwater quality monitoring: definitions; locations; frequencies ii) Aquatic ecotoxicology: Environmental characteristics of pollutants; sources,

										transport and fates; risk assessment; QSARS; test organisms and methods iii) Data analysis and presentation: descriptive statistics; statistical testing; using significance levels in water quality monitoring; regression analysis; exercises; presentation of data iv) Water quality modelling: definitions and concepts; mathematical backgrounds; modelling BOD/DO in a river system; GIS modelling of a river basin; case studies and hands-on computer exercises v) Field and laboratory work in water quality monitoring: water and sediment sampling; storage and preservation methods; field measurements. Quality control in a laboratory vi) excursion(s) in the field of water quality monitoring and/or modelling.
15.2		Industrial resource management and cleaner production	EN	5		1	2	65	141	This course teaches how to use the different system tools that support industrial ecology. Students will be taught to assess the environmental impact of products and processes, and to suggest options for preventing pollution within urban and industrial water management settings. They will learn how to make basic calculations related to life cycle analysis. They will learn how sustainable use of resources can be beneficial for reducing environmental burden(s) learn, and how to suggest treatment/disposal methods for industrial wastewater from which the value has been taken out. The students will learn about the importance of environmental management systems in the industrial context.
15.3		Ecotechnologies	EN	5		1	2	62	140	In this course the students will learn to assess the value of wetlands and explain the use of natural and constructed wetlands for the treatment of wastewater. They will be learn how to describe the concept of wastewater treatment by wetlands and how to design and operate a wetland treatment system.
16		***Track "Wastewater treatment plant design and engineering*** "								
16.1		Wastewater treatment plant design and engineering	EN	5		1	2	76	140	The aim of this course is to identify and estimate the construction, operational and maintenance costs of a wastewater treatment plant and the investments required to

										secure its satisfactory operation throughout the expected life-span of the system. They will carry out a preliminary design of a wastewater treatment system (based on the most widely applied systems) including the engineering process lay-out, hydraulic profile and process flow-diagram. The students will select the most suitable and cost-effective wastewater treatment process technology to treat certain wastewater streams. They will also learn about project planning, project management, and project administration for the design, engineering, construction, start-up and operation of a wastewater treatment plant.
16.2		Modelling wastewater treatment processes and plants	EN	5		1	2	72	134	Students in this course will learn to use the basics, evaluate data and processes, of wastewater treatment modelling, using practical examples. They will develop a matrix for a biological model, they will be able to explain the modeling history and modeling of MBR systems. Can simulate an existing model using BioWin and explain the results. They will be able to use the computer software AQUASIM, Excel and BioWin as tools for modelling wastewater treatment processes and for case studies.
16.3		Industrial effluent treatment	EN	5		1	2	68	148	The aim of this course is to define and describe sludge handling and sludge treatment, and to explain the needs for these activities in the context of industrial wastewater treatment. The students will integrate cleaner production, industrial water management, wastewater treatment processes, and sludge handling and disposal in the design on an industrial waste treatment process for a selected industry. The will learn to recognize wastewater treatment technologies applied to industrial waste treatment and analyze industrial waste schemes from case studies. For cleaner production activities, they will look at industrial water management strategies for pollution and toxicity prevention.
17	I001865	ELECTIVE Basic Dutch for Foreigners	EN	2		1	2	30	60	Like for the Czech course the students will gather basic knowledge about the Dutch language. Familiar everyday expressions will be taught and frequently used phrases aimed

										at the satisfaction of needs of a specific type will be explained. Emphasis will be laid on topics such as: personal introduction, basic personal and family information, food and restaurants, shopping. The students will learn how to ask and answer questions about personal details.
2.1 Ghent University, Gent **15 ECTS Advances Environmental Technology and Engineering compulsory courses, + 8 ECTS elective specialization tracks**										
Nr	**Code**	**Course Name**	**Lang**	**ECTS**	**Ref**	**MT1**	**Session (sem1/2/yr)**	**Contact hrs**	**Study hrs**	
1		Advances & Trends in Environmental Technology (Gijs Du Laing)	EN	3		2	1	30	75	Students are exposed to international environmental issues through selected speakers. An environmental topic is tackled in an international workshop-style format which is also open to any interested participants from research institutes, industry, or government.
2		Basics of Process Engineering (Frederik Ronsse)	EN	3		2	1	30	75	This course introduces general engineering skills related to the quantitative engineering of technological processes connected to environmental remediation. The technical aspects of relevant unit operations in mass and energy transfer are quantitatively elaborated to allow for design and dimensioning of environmental technology.
3		Basics of Control Engineering (Eveline Volcke)	EN	3		2	1	30	75	The aim of this course is to introduce control engineering concepts. Through practical examples, the student is familiarized with the block scheme representation of controlled systems. After imparting the necessary understanding of the dynamic behaviour of linear systems, the relationship between open-and closed-loop dynamics is elaborated. Attention is paid to the selection and tuning of controllers. Besides the basic single-loop feedback scheme, cascade control and feedforward control schemes are studied as well.
4		Bioresource Recovery Processes and Engineering (Korneel Rabaey & Erik Meers)	EN	6		2	1	60	150	Increasingly, classical end-of-pipe technology is being replaced by technologies aimed at recovering and reusing resources contained in waste streams. This course expands

										on biotechnological and physicochemical technologies aimed at resource recovery. Key topics that are discussed include anaerobic digestion, recovery of nutrients such as nitrogen and phosphorus, as well as emerging approaches for production from wastes.
Ghent University, Gent **8 ECTS elective tracks**										
Nr	**Code**	**Course Name**	**Lang**	**ECTS**	**Ref**	**MT1**	**Session (sem1/2/yr)**	**Contact hrs**	**Study hrs**	
6		***Track: "Air"***								
6.1		Urban and Indoor Air Pollution (Herman Van Langenhove)	EN	5		2	1	60	135	The course focuses on specific air pollution issues, i.e. pollution that highly impacts the living conditions of humans with focus on urban air pollution and indoor air pollution.
6.2		Advanced Waste Gas Treatment (Herman Van Langenhove)	EN	3		2	1	30	75	This course focuses on the principles and applications of state-of-the-art and advanced biological and physical-chemical treatment techniques to remove a broad variety of both gaseous and particulate, inorganic and organic pollutants from waste gases. Students are informed about recent evolutions in internationally applied prevention and reduction methods and strategies; and practical examples and specific case studies are discussed to illustrate the content of this course.
7		***Track: "Soil"***								
7.1		Pedology (Peter Finke)	EN	3		2	1	30	75	This course provides general soil science concepts relevant for the environmental professional specialising in contaminated soil management and remediation. Students learn to understand the nature, properties and functioning of natural soils with attention for the link with the environment.
7.2		Soil Remediation (Filip Tack & Wim Cornelis)	EN	5		2	1	40	150	This course aims at providing a thorough knowledge and insight in concepts applied for the remediation of contaminated soils. Students should become aware of the possibilities and limitations associated with different

										conceptual approaches. They should be able to draw, in general terms, a concept of a proposal for a remediation program from site assessment to remediation.
Ghent University, Gent Elective courses										
8		Subscribe to course units from the master programmes at UGent, (excl. internships or other integration course units).	EN	7		2	1			Elective courses allow students to broaden or specialise according to their interests and needs, Upon approval of programme responsible and IMETE management board. To be taken in the third semester or fourth semester in Gent.
Stichting IHE Delft Elective Internship (IHE Delft – summer)										
Nr	**Code**	**Course Name**	**Lang**	**ECTS**	**Ref**	**MT1**	**Session (sem1/2/yr)**	**Contact hrs**	**Study hrs**	
9		Internship – Elective	EN	7		2	1	30	210	The course 'Internship' covers a training period in a workplace, either a company or a research institution. The student will be engaged in every-day working activities at a level corresponding to the final degree.
2.2 Master dissertation (Promoter from 'core' partner, co-promoter can be from associated partner)										
Nr	**Code**	**Course Name**	**Lang**	**ECTS**	**Ref**	**MT1**	**Session (sem1/2/yr)**	**Contact hrs**	**Study hrs**	
10		Master Dissertation	EN	30		2	2	300	900	Master thesis in the field of Environmental Technology and Engineering to be conducted either at UCT Prague, IHE Delft, Ugent or at one of the associated partner under the promotorship of a professor from at least one of the beneficiary The state final oral examination is an integral part of the thesis defence. The student will be asked questions from selected subject areas listed below based on his/her master dissertation topic. Full list of subject areas: Environmental Engineering Environmental Microbiology Wastewater Treatment Atmosphere Protection Technology Waste Management and Treatment