Curriculum for the

Master's Programme
Master of Engineering in Cleanroom Technology

at Graz University of Technology

AMENDMENT

On 27 June 2016, the Senate of Graz University of Technology approved an amendment to the curriculum for the master's programme "Reinraumtechnik, Master of Engineering (MEng)" announced in the bulletin of 31 January 2012, no. 8b., 3rd special edition. This amendment was passed by the Curriculum Committee for Doctoral Studies and University Programmes.

Curriculum for the master's programme Master of Engineering in Cleanroom Technology

General regulations

§ 1 Qualification profile

Initial situation

Clean room technology is required in nearly all areas of industrial production and processing as well as in many areas of the service industry and the healthcare system. This branch is growing rapidly, yet currently there is a shortage of qualified technicians worldwide.
The unusually complex and broad area of expertise that is clean room technology includes many individual trades, yet it is not a distinct profession in its entirety.
Most existing educational concepts claim to train specialists in the individual trades. Contradictory opinions and concepts often come about with this approach.

Objective of the programme

The main objective is to assure the high quality of work in cleanrooms — in the pharmaceutical industry, in clinics, in microelectronics and in the food industry — in the long-term and to continue to improve it as well as to offer comprehensive part-time education and training at an advanced level in the area of cleanroom technology primarily with regard to technology, humans and the environment.

Upon completion of the programme, participants will have acquired the following competences:

- They have mastered the fundamentals of scientific work and of business that provide the basis for a comprehensive understanding of the complex relationships of cleanroom technology in a constantly changing industrial and technological environment.
- They know the essential national and international legal guidelines and standards and have the ability to use them to approve, set up and run a cleanroom with appropriately qualified personnel.
- They are capable of functioning as an interface between cleanroom designers and cleanroom operators.
- They have mastered the fundamentals of qualification and validation of cleanroom facilities and technological processes.
- They have mastered the fundamentals of microbiological and technical analyses of procedures, processes and materials.
- They have mastered the fundamentals of scientific work and should be capable of working independently in industrial research and development upon completion of the master's thesis.
- They can develop and implement sustainable strategies in an interdisciplinary working environment.
- They can recognize and overcome problems and resistance when implementing solutions.

Target groups

The target groups are composed of a wide variety of areas according to the complexity of the topic: medical technicians, microelectronics engineers, process engineers, architects, civil engineers, engineers from the pharmaceutical industry and the food industry, medical doctors, facility planners, facility builders and government representatives.

Future fields of work

Future fields of work are diverse and range from government agencies, planning companies, engineering offices, consulting businesses, facility builders and component manufacturers to producers in industry from the life sciences, the food industry and the electronics branch.
Cleanroom technicians with a university education are required in particular for preliminary evaluation, planning and tenders and research and development in businesses as well as for the maintenance of standards, guidelines and legal principles.

§ 2 ECTS credits

In line with the European Credit Transfer and Accumulation System (ECTS), the individual courses are assigned a certain number of ECTS credits which reflect the workload of the students. One full-time academic year consists of 60 ECTS credits.

§ 3 Duration and structure

(1) The programme including the master’s thesis lasts five semesters and consists of 90 ECTS credits.

(2) Courses with a total of 73.5 ECTS credits and a comprehensive final paper (16.5 ECTS credits) are scheduled.

(3) The programme is not formally divided into stages. Its content is divided into three modules and a master's thesis.

§ 4 Language of instruction

(1) The courses are offered in German and/or English as necessary.

(2) The academic direction is responsible for assessing whether the language skills of programme participants are sufficient.
Minimum number of points/level on language tests:
TOEFL: 600 points;
Deutsche Sprachprüfung für den Hochschulzugang: Level DSH-2;
Test Deutsch als Fremdsprache: Level TDN 4.
Participants whose language skills are insufficient who have reached level DSH-1 or TDN 3 can be admitted by the academic direction with the provision that they attend a language course alongside the programme.

Programme Organization

§ 5 Academic direction

(1) A qualified member of the Institute of Process and Particle Engineering at Graz University of Technology who has a teaching qualification in a relevant subject is to be appointed the head of the programme by the responsible academic authority.

(2) The programme director appoints other employees to academic and administrative positions according to the organizational demand.

(3) An academic advisory board is established for the purpose of evaluating and further developing the programme.

(4) The Institute of Process and Particle Engineering at Graz University of Technology is entrusted with the academic direction of the programme. The programme is managed by TU Graz Life Long Learning.

§ 6 Programme costs

(1) In order to run the programme cost-effectively, a programme fee will be set by the rectorate of Graz University of Technology following the recommendation of the academic direction. If needed, the fee can be adjusted to meet budgetary demands.

(2) A financial management report on the programme must be presented to the rectorate once a year.

Admission

§ 7 Admission requirements

(1) You must have one of the following qualifications to be admitted to the master's programme Master of Engineering in Cleanroom Technology:

a. An internationally recognized academic degree (bachelor's, master's or diploma degree from a university or university of applied sciences in Austria or abroad) in a technical subject, in the natural sciences or in economics.

   If you have an economics degree, you also need 2 years of relevant professional experience in cleanroom technology.

b. An internationally recognized degree in human medicine or veterinary medicine.

(2) Proof of sufficient language skills may be required by the admissions committee (cf. § 4).

§ 8 Application and admission procedure

(1) Application to the programme is to be submitted in writing to the academic direction.

(2) The right to participate in a master's programme is not granted with the application. The prerequisite for admission is the positive completion of the selection procedure conducted by the academic direction. The academic direction checks the documents that have been submitted to determine whether the admission requirements in the curriculum have been met. It also reserves the right to conduct application interviews to determine personal suitability and motivation if necessary. The academic direction has a right to reject applicants.

(3) The granting of a place in the study programme is communicated in writing by the academic direction. Admission as a master's student is granted by the Rectorate and administered by the Registration Office.

§ 9 Places in the programme

(1) The number of places available in the programme is set by the academic direction taking into account pedagogy and organization and in accordance with the business plan. Due to the limited number of places in the programme, participants are selected using a ranking procedure. The academic direction, however, reserves the right to consider lower ranked or late applications on a case by case basis.

(2) If the number of applicants that meet the admission requirements is larger than the number of places available in the study programme, the following criteria should be taken into account during the selection: educational background, type and duration of professional experience and a balanced composition of the programme group in terms of the variety of the fields of work and the educational background of the participants. Gender balance should also be considered.

Programme structure

§ 10 Courses

The programme consists of the courses listed in the appendix. A cleanroom-related module that is directly connected to cleanroom technology should be integrated into each course. This related module must consist of at least two teaching units (45 minutes each) and should involve specific application of a method that has been learned to a practical task. The related modules should be coordinated with the academic direction one month before the start of the course.

§ 11 Examinations

(1) The course instructor is responsible for the grading of that course. He or she has to define the examination mode (written or oral examination, homework, rating of the participation) at the beginning of the course.

(2) The final examination is conducted as an oral defence of the master's thesis in front of an examination committee.

(3) In addition to the individual grades for each course, an overall grade is given. The overall grade has to be "passed" if each individual course is assessed with a positive grade; otherwise it has to be "not passed". The overall grade has to be "passed with distinction" if each course and the defence of the master's thesis are assessed with the grade "very good" or "good" and at least half of the courses are graded "very good".

(4) Negatively assessed examinations can be repeated up to four times; this must occur by the end of the second semester after the one in which the course took place.

§ 12 Accreditation of examinations

(1) Positively assessed examinations from equivalent courses in the university programme Academic Cleanroom Engineer (original version 2012 and version 2016) are recognized.

(2) Positively assessed examinations from equivalent courses at recognized domestic and foreign post-secondary educational institutions can be accredited upon the filing of a petition by the student.

§ 13 Master's thesis

(1) The content of the master's thesis is oriented towards current studies, analyses, developments and/or research areas in the appropriate field. The work can be carried out in cooperation with an industrial partner.

(2) The name of the advisor, the working title of the master's thesis and a description of its content must be submitted in draft form to the academic direction before the work is started.

(3) The fifth semester is scheduled for the writing of the master's thesis. When the work is completed, it should be submitted to the advisor for assessment.

Completing the programme

§ 14 Final examination before a committee

(1) Academic success is established by means of positively assessed examinations in the individual courses (see § 11), the positive assessment of the master's thesis (see § 13) and a final examination in front of a committee.

(2) The final examination before a committee takes place before an examination committee of three members nominated by the academic director. The advisor of the master's thesis must be a member of the examination committee. If unable to attend, he or she may suggest an alternate. The final examination deals with the topic of the master's thesis and associated subjects. There is also a defence of the master's thesis.

§ 15 Academic degree

Once the final examination has been successfully completed, the participant is issued a diploma and the academic degree of “Master of Engineering in Cleanroom Technology” (abbreviated "MEng Cleanroom Technology") is awarded by official notification.

Final regulations

§ 16 Validity of the curriculum

This curriculum becomes effective on the first day of the month of the announcement in the bulletin of Graz University of Technology.

§ 17 Organizer

Graz University of Technology

Module Fundamentals and Introduction

Title	Content	ECTS	SS
Introduction to the university programme	Proseminar: organization of the programme, basics of cleanroom technology	1	0.7
Introduction to scientific writing	Databases, rules of citation, presentation skills	0.5	0.3
Fundamentals of microbiology	Microorganisms, analysis methods, sterilization and decontamination technology	3	2
Fundamentals of hygiene	Cleaning, disinfection and sterilization; decontamination: garment basics	2	1.3
Fundamentals of chemical and process engineering	Heat and mass balances; thermodynamics	2	1.3
Transport phenomena	Heat and mass transfer; similarity theory	3	2
Fluid mechanics	Mathematics basics, fundamentals of fluid flow, turbulence, boundary layer theory, mixing	4	2.7
Fundamentals of material sciences	Overview of materials, properties, surfaces	3	2
Fundamentals of measurement instrumentation, control theory and electrical engineering	Measurement technology, feedback control systems and fundamentals of electrical engineering	4	2.7
Introduction to technical documentation	Technical drawings and documentation	2	1.3
Introduction to computer simulation	Introduction; interpretation of simulation results	2	1.3
		26.5	**17.6**

Module Elements of Cleanroom Technology

Title	Content	ECTS	SS
Cleanroom Technology: construction technology	Cleanroom design; heating, ventilation, air conditioning and refrigeration (HVACR) equipment; lighting	4	2.7
Cleanroom Technology: cleanroom components	Safety cabinets, air locks and air showers, floor systems, garments	4	2.7
Cleanroom Technology: cleanroom operation	Professional behaviour in cleanrooms, air locks and air showers; measurement exercises; regulations and personnel training	4	2.7
Introduction to particle technology	Particle characterization, particle size distributions, fundamentals of sedimentation and filtration technology	2	1.3
Filtration technology	Filtration technologies and methods; filter types and their applications	2	1.3
Cleanroom monitoring	Measurement techniques for the online monitoring of cleanrooms	2	1.3
Regulations and audits	Standards and legal regulations; audits	2	1.3
Qualification and validation	User requirements, qualification and validation, quality management	4	2.7
Quality by design	Quality by Design methodology and tools	2	1.3
Introduction to project management	Project leadership; professional communication and conflict management	3	2
Introduction to risk management	Risk analysis, risk aggregation, management of risks, and risk monitoring	2	1.3
Business administration tools	Calculation of investment costs and operating expenses	3.5	2.4
		34.5	**23**

Module Specialisation and Practice

Title	Content	ECTS	SS
Excursion	Professional behaviour inside and outside of cleanrooms	1	0.7
Central case project	Design of a cleanroom, a cleanroom-relevant system, or a product	6	4
Food microbiology and food technology	Technological overview; bottling and packaging technology; product germ flora	2	1.3
Computer simulation in cleanroom applications	Models and algorithms; novel simulation methods; transient CFD simulation on supercomputers	3	2
		12	**8**

Master's Thesis

Title	Content	ECTS	SS
Introduction to scientific writing 2	Writing scientific reports and publications	0.5	0.3
Master's thesis	Project work at a university and/or a company	16.5	11.0
		17	**11.3**