The following text is a translation of the Curriculum in German language.

In case of discrepancies the German text (as to be published in the Information Bulletin of the Medical University of Vienna („Mitteilungsblatt der Medizinischen Universität Wien“)) shall prevail. The Course aims at fulfilling all requirements of the EC and the IAEA for the education of medical physics experts.

CURRICULUM

I General Information

§ 1 Objectives of the University Course in Medical Physics

The University Training Course in Medical Physics aims at providing post-graduate training for physicists and university graduates of related disciplines in the field of medical physics with focus on tasks performed in hospitals and other clinical institutions. The curriculum of the Course is designed to provide both theoretical knowledge and practical skills in medical physics, thus enabling postgraduates of the Course to perform various tasks at hospitals and other clinical institutions as medical physicists in diagnosis and therapy as well as to hold a responsible position in the development and manufacture of novel medical devices at industrial enterprises producing medical devices. Furthermore, the Course aims at providing the required expertise covering all issues in the field of radiation protection, thus enabling the graduate to act as a radiation protection officer in medicine in accordance with § 41 of the General Regulation of Radiation Protection ("Allgemeine Strahlenschutzverordnung") issued in the Austrian Federal Law Gazette II No. 191/2006 as amended ("Allgemeine Strahlenschutzverordnung, BGBl. II Nr. 191/2006 idgF").

Persons who successfully complete the Course are provided with an adequate theoretical knowledge in accordance with the relevant guidelines issued by the European Federation of Medical Physics (EFOMP) and the Austrian Society for Medical Physics (ÖGMP), as required for the professional recognition in medical physics ("Fachanerkennung für Medizinische Physik"). They may work as medical physicists in Austria in accordance with the medical radiation protection regulation ("Medizinische Strahlenschutzverordnung"), as stipulated in § 6, paragraph 1 Z 1, of the Federal Law Gazette II No. 409 / 2004. They may therefore be in charge of all functions stipulated in the radiation protection regulations for medical physicists.

§ 2 Qualification Profile

In order to pursue the occupation of medical physicist as referred to in § 1, Course participants are to acquire both general knowledge and special skills such as:

- general knowledge of the medical, mathematical, physical, and technical basics which enable them to exercise the profession of medical physicist in any relevant clinical institution,
- profound knowledge and skills in medical radiation protection, expert knowledge in the management and quality assurance of major medical appliances,
- special expertise in medical physics in radiation therapy, nuclear medicine and X-ray diagnostics.

Diploma holders will be qualified to
• possess profound knowledge on principles and methods in physics. They will be able to apply such principles and master techniques for and skills in diagnosis, treatment and prevention of diseases,
• be in charge of development and research in the above mentioned areas,
• be well aware of limitations in the application of physical and technical methods and techniques in a hospital or a clinical institution,
• be well aware of the importance of safe working methods and of the basic safety regulations and be able to apply them in clinical work,
• be both critical and open-minded towards technological trends and developments in medicine.

§ 3 Partner Universities

The Course may be organized in co-operation with a partner university in order to provide mutual economic and organizational benefits. Any further details on such co-operations with a partner university shall be stipulated in a separate co-operation agreement.

§ 4 Duration and Structure of the Course

(1) The Course lasts 6 semesters and consists of compulsory modules or lectures with a total of 40 semester hours, with 28 semester hours in theoretical lessons and 12 semester hours in practical work and seminars, thus totalling 68 ECTS.

(2) The Course is organized as an extra-occupational programme. Lectures may also be held during non-lecture periods. Part of the theoretical modules or lectures may also be organized as correspondence courses. The language of instruction is English.

§ 5 Enrolment Requirements

(1) Admission to the Course requires:

a) holding a M.Sc. degree awarded after successful completion of a full and regular university study or a university degree equivalent to a successfully completed university study at an officially recognized domestic or foreign institution for higher education equivalent to at least 300 ECTS in one of the following fields of study:

• Physics, with the applicant having to furnish proof of the successful completion of lectures and practical training in nuclear and isotope physics totalling 10 ECTS. Previous training must include basic knowledge of nuclear physics phenomenology as well as background knowledge of the subject matter. The subject comprises the structure, general properties, internal conversions and interactions (radioactivity and nuclear reactions) of atomic nuclei (including the accompanying nuclear processes), research techniques by means of the most important tools as well as relevant practical applications in science, medicine and technology.

or

• holding a master’s degree in a related field of science and technology, with the applicant having to furnish proof of the successful completion of the following subjects of study in addition to the successful completion of a course in nuclear and isotope physics as required in lit. a):
  − Introduction to physics to the extent of 20 ECTS. Proof of lectures completed by an exam and practical lessons providing basic knowledge of the mechanics and the physics of heat. These include: mechanics of mass points and rigid bodies, elasticity, friction, statics and dynamics of fluids, oscillations and waves, temperature, ideal and real gases, phase diagrams, entropy, laws of thermodynamics, heat conduction, cycles, electrostatics, capacitor, dielectric polarization, DC, AC, resistance, electrical conduction in gases, fluids and solids, magnetostatics, magnetic properties of matter, induction, AC circuits, electromagnetic...
oscillations and waves, Maxwell's equations, wave optics, geometrical optics, optical instruments, elements of the theory of relativity.

- 5 ECTS lectures and exercises on the calculation methods of physics.
  Contents include: functions, vectors, differentiation, integration, Taylor series, complex numbers, geodesy, differentiation by fields, integration of fields, ordinary differential equations.

- 7 ECTS lectures and exercises in applied linear algebra.
  Contents include: basic vector calculus, vectors in the plane and in the three-dimensional space, vector addition, scalar product, vector product, notation of theoretical physics (total convention, Kronecker symbol); vector space over R and C; basic concepts - linear independence and dependency, subspace, basis; matrices; linear maps, matrix representation, kernel and image of transformations, the linear functional, dual space; systems of linear equations, Gaussian elimination; determinants; eigenvalues, eigenvectors, characteristic polynomial.

- 8 ECTS lectures and exercises in applied analysis.
  Contents include: terminology of set theory; Integers, rational numbers, real numbers, complex numbers, field axioms; sequences of real numbers, the concept of convergence, open and closed subsets of the real numbers; function term, steady functions, limits; transcendental functions - trigonometric functions, logarithm, exponential function (real and complex); differential calculus; differentiability, calculation rules, higher derivatives, maxima and minima, convergence of function sequences, Big O notation; Integration - integral term fundamental theorem of differential and integral calculus, partial integration, substitution rule, improper integrals; expansions - real series numbers, power series, Taylor's theorem.

b) holding a degree in physics or a successfully completed regular study in physics completed with a Bachelor's degree or equivalent in a recognized domestic or foreign institution for higher education equivalent to at least 180 ECTS and proof of the positive completion of the subjects of "nuclear and isotope physics" in accordance with lit. a) as well as a valid admission to a regular university study for a master's degree in physics.

Prior to the successful completion of the Course, participants are to furnish proof of having successfully completed a regular university study in physics and of holding a master's degree equivalent to 120 ECTS.

c) sufficient command of the English language so as to read and understand relevant technical literature and to understand specialized lectures.

d) sufficient computer skills to be at ease in the use of an e-learning platform as well as in consulting literature databases.

(2) The application for admission must include a letter of application, all relevant university reports and course certificates, and a Curriculum Vitae.

(3) Admission to the Course is possible only before the beginning of the Course. The head of the study programme is to decide on the maximum number of students to be admitted to the Course, taking also into account the available places for the Course.

(4) In accordance with § 70 (1) iVm § 51 (2) Z 22 UG ("Austrian Universities Law"/"Universitätsgesetz"/"UG"), as amended, prospective participants must apply for admission to the Course as non-regular students. Based on the nomination of candidates by the course management, the Rector's Council of the Medical University of Vienna will decide upon their admittance.
II Study and Assessment Regulations

§ 6 Course Catalogue (Curriculum)
The curriculum encompasses the modules or courses specified below:

Compulsory Modules (Lectures and Seminars/Practical Courses):

Anatomy, 30 academic hours, 4 ECTS, written exam
Content: Musculoskeletal system, cardiovascular system, respiratory system, digestive system, endocrine glands, skull, eye, central nervous system, sensory organs.

Physiology, 45 academic hours, 6 ECTS, written exam
Content: Structure and function of the cell, transport and control processes, muscles, blood and immune functions, heart, vascular system and blood circulation, respiratory tract and breathing, kidney, neurophysiology, listening, sight, hormonal system, metabolism.

Introduction to Clinical Oncology and Radiotherapy for Physicists, 15 academic hours, 2 ECTS, written exam
Content: Tumorgenesis, tumor classification, metastasis, oncology patient management and radiotherapy of malignant, treatment strategies, treatment-related side effects and benign diseases.

Biomathematics and Statistics, 15 academic hours, 2 ECTS, written exam
Content: Basic concepts of statistics, statistical tests, statistical software, medical informatics, hospital information systems, retrieval, expert systems.

Biophysics, 15 academic hours, 2 ECTS, written exam
Content: Muscle, bone, thermodynamics, electrical signals, blood circulation, macromolecules, aerosols

Medical Optics and Optical Imaging, 15 academic hours, 2 ECTS, written exam
Content: Optical matrices, Gaussian wave optics, waveguides, resonators, optical imaging

Laser Safety, 15 academic hours, 2 ECTS, written exam
Content: Induced emission properties of laser light, interaction of laser light with tissue, laser protection, light optics, and physics of laser applications laser in gynecology, urology; vascular surgery, neurosurgery, ophthalmology, gastroenterology, dermatology and ENT, lithotripsy, laser, photodynamic therapy.

Biomedical Engineering, 15 academic hours, 2 ECTS, written exam
Content: Bioelectric signals, structure, and properties of sensors, derivation of biosignals using sensors, functional rehabilitation, electrostimulation.

Physical Measurement Techniques, 15 academic hours, 2 ECTS, written exam
Content: Pharmacological models, models for the cardiovascular system, measuring blood pressure, and flux measurement, cardiovascular circulation, breath analysis, anesthesia equipment, electrical safety.

Hospital Management, 15 academic hours, 2 ECTS, written exam
Content: General principles of the hospital organization as an example of a University Hospital (AKH Vienna), responsibilities and tasks for persons working in health care institutions, legal requirements, liability issues, budget targets.

Radiation Biology, 15 academic hours, 2 ECTS, written exam
Content: Cellular radiobiology: target structures, DNA repair, clonogenic cell survival, modes of cell death, cell cycle effects, oxygen effect, impact of radiation quality; Radiation risk; Radiation effects on normal tissues: Pathogenesis, dose dependence, latent times, example tissues, dose fractionation, overall treatment time, volume effects; Radiation effects on tumors: tumor regression, tumor control, tumor hypoxia; Radiooncological therapy: radiotherapy protocols, combined therapies, normal tissue protection;
Ultrasound, 30 academic hours, 3 ECTS, written exam and continuous assessment during practical experiments
Content: Physical foundations of the propagation of ultrasonic waves, reflection, scattering, absorption, Frequency dependence of interactions, Doppler, ultrasound imaging, methods properties of sound mission sources, spatial resolution of ultrasound, dynamic signal bandwidth, a, b, M-mode scanner; Composite transducer, real time scanner: linear scanners, sector scanners, phase array; imaging artifacts.

Radiodiagnosis I, 30 academic hours, 3 ECTS, written exam and continuous assessment during practical experiments
Content: Production of X-rays, X-ray, generator type, X-ray spectra, absorption, properties of the projection, scattered radiation, intensifying screens and X-ray films, storage foils, xeroradiography, image noise.

Radiodiagnosis II, 30 academic hours, 3 ECTS, written exam and continuous assessment during practical experiments
Content: Conventional tomography Pan tomography, image amplifier, MTF, methods of digital imaging, computed tomography, X-ray dose load.

Radiation Therapy I, 45 academic hours, 5 ECTS, written exam and continuous assessment during practical experiments
Content: Sources for photon radiation, gamma emitter, x-ray equipment, linear accelerator, betatron, interactions of photons with matter, radiation sources for charged particles, electron sources, interaction of charged particles with matter, radiation fields, dose terms, particle accelerators, teletherapy equipment, therapy dosimeters: construction and practical application.

Radiation Therapy II, 30 academic hours, 3 ECTS, written exam and continuous assessment during practical experiments
Content: Methods of radiotherapy (teletherapy, brachytherapy and telecurieherapy).

Radiation Therapy III, 30 academic hours, 3 ECTS, written exam and continuous assessment during practical experiments
Content: Treatment planning, quality assurance, practical examples in radiotherapy, radiotherapy equipment.

Nuclear medicine I, 30 academic hours, 3 ECTS, written exam and continuous assessment during practical experiments
Content: Physical basics of radioactive decay, radionuclides, measurement of activity in vivo, whole body counters, probe measurement, imaging procedures: collimators, gamma camera, SPECT; PET.

Nuclear Medicine II, 30 academic hours, 3 ECTS, written exam and continuous assessment during practical experiments
Content: Basics of tracer kinetics, compartment models, dose calculation, in vivo investigation; body scan with SPECT, computer-aided diagnostic methods, functional images

Magnetic Resonance I, 30 academic hours, 3 ECTS, written exam and continuous assessment during practical experiments
Content: Electromagnetic fields, physical and mathematical foundations of MR imaging, the main pulse sequences, image artifacts, contrast, instrumentation, security aspects.

Magnetic Resonance II, 15 academic hours, 2 ECTS, written exam and continuous assessment during practical experiments

Digital Image Processing I, 30 academic hours, 3 ECTS, written exam and continuous assessment during practical experiments
Content: Analog-to digital conversion, psycho-physiological bases and display, hardcopy, transformation intensity histograms, linear and non-linear filters, Fourier transform.

Digital Image Processing II, 30 academic hours, 3 ECTS, written exam and continuous assessment during practical experiments
Content: Tomographic image reconstruction using algebraic and analytical methods, spatial transformations in 2D and 3D, image fusion and registration, compression, and data management

*Medical Radiation Protection, 30 academic hours, 3 ECTS, written exam and continuous assessment during practical experiments*

Content: Interaction, physics on radiation protection unit dosimetry, microdosimetric applied devices, shielding, experiment design, stochastic and non-stochastic error analysis, environmental contamination, current legislation

§ 7 Recognition of Examinations

Upon request of the participant, the managing head shall decide, on behalf of the curriculum director of the Medical University of Vienna, on the recognition of studies carried out in other universities and scientific institutions.

§ 8 Compulsory Attendance

(1) Attendance at seminars or internship or other practical work is mandatory. The number of hours missed per practical course may not exceed 10 % of the total hours scheduled.

(2) In the event that the number of missed hours exceeds 10 %, the managing head shall decide whether the student must repeat the relevant module or course.

§ 9 Examination Regulations

(1) Examinations aim at establishing whether the course participant has achieved the objectives of each individual course or module. Course-related examinations are generally administered by the lecturer or instructor of the respective course. The curriculum encompasses the following types of examinations:

- lectures: written or oral examinations
- seminars (practical courses): providing continuous assessment

(2) Examinations (lectures): Each module has to be concluded with an oral or written examination at the end of a module. Participants shall be appropriately informed about the method or type of examination at the beginning of a course.

   a) Oral exams: Oral exams are to be held by the lecturer or instructor either in the form of colloquia (one-on-one conversations) or in presentations.

   b) Written exams: The questions of a written exam shall be answered in writing.

(3) Continuous assessment courses (seminars or practical courses): Participation in seminars being hold as continuous assessment courses (“prüfungsimmanente Lehrveranstaltungen”) is not evaluated by means of a final exam at the end of the course or module. Students’ performance is rather assessed taking into account their continuous participation in terms of written papers and/or oral presentations. Attendance at such courses is compulsory. The lecturer or instructor of a given seminar or practical course is generally in charge of course-related examinations in the subject matter.

(4) Examination procedures are stipulated in §§ 72 of the Austrian Universities Law (“Universitätsgesetz”/”UG”), as amended, as well as in the relevant provisions laid down in
section II of the Statutes regulating University Studies at the Medical University of Vienna („Satzung der Medizinischen Universität Wien“), as amended (i.e. §§ 14 and the following §§).

(5) Absence from examinations:
In the event that an examinee fails to show up for an examination due to illness or any other valid reason and he/she has given written or oral notice in due time, he/she is entitled to repeat the examination at the earliest possible date.

§ 10 Academic Grading

(1) Participants’ performance will be assessed according to the laws and legal provisions regulating university studies at the Medical University of Vienna, i.e. § 73 of the Austrian Universities Law/„Universitätsgesetz“/„UG“ as amended will be applied, as well as the relevant provisions laid down in section II of the Statutes regulating University Studies at the Medical University of Vienna, as amended („Satzung der Medizinischen Universität Wien idgF“).

(2) After successful completion of the University Course in Medical Physics, an overall grade is assigned to the graduate. The overall grade “Passed” is given if all examinations specified in the curriculum have been passed successfully. The overall grade “Passed with Distinction” is conceded if the graduate has been graded as “Good” in every module and he/she has been graded as “Excellent” in at least 50 % of all modules encompassed in the curriculum.

(3) The overall grade is to encompass all single examinations taken during the Course.

§ 11 Premature Termination of the Course and Cancellation Fee

(1) The training will be considered as terminated if the participant is absent of more than 10 % of the courses or modules with compulsory attendance without valid excuse. In the event of a valid excuse in more than 10 % of all courses missed, the participant must repeat the missed seminar or courses.

(2) If an attendant fails to pay the tuition fee in due time, the participant will not be able to continue with his/her studies if he/she fails to pay the due tuition fee within 14 days upon written overdue notice.

(3) The tuition fee is to be paid in advance per semester not later than 14 days upon receipt of the invoice before the beginning of the Course.

(4) If a participant terminates or cancels his studies during the semester, the tuition fee for the respective semester shall be withheld and shall be charged as a cancellation fee. In the event of a cancellation at the end of the semester, no further cancellation fee shall be charged.

§ 12 Completion of the Course and Academic Degree

(1) In order to obtain the academic degree as “Certified Medical Physicist”, participants must have successfully passed all the examinations encompassed in the curriculum, in accordance with the examination regulations. Participants admitted to the Course according to § 5 lit. b) must provide proof of having successfully completed a regular master's degree in physics equivalent to 120 ECTS before completing the University Course in Medical Physics.

(2) The successful completion of the Course will be documented in a final certificate with the degree “Certified Medical Physicist”, awarded by the Medical University of Vienna upon official notification.

(3) All the modules and their corresponding lectures will be specified in the final study certificate, including the total amount of hours and the grades obtained in each subject. The final certificate will register both the subjects successfully completed as “Passed” and those grades as “Failed”. The amount of ECTS awarded will be equally specified in the final study certificate.
III Management

§ 13 Scientific Management of the Study Programme

(1) The Course will be managed by the head and three deputy members of the teaching staff. The Rector of the Medical University of Vienna shall nominate the head of the Course. The Rector shall also nominate a deputy head upon proposal of the head of the training course.

(2) The Scientific Management Board shall primarily be in charge of the tasks specified below:

- to decide on the recognition of degrees awarded by a foreign university
- to decide on the admission of prospective participants in the Course
- to decide on behalf of the head of the curriculum on the recognition of the academic performance and skills of an applicant acquired at another university or at other universities
- to come forward with a proposal as to which candidate shall be nominated and appointed deputy head
- to come forward on behalf of the Rector of the Medical University of Vienna with a proposal as to which candidates shall be nominated and assigned as qualified lecturers
- to come forward with a proposal as to which candidates shall be nominated for the Managing Advisory Board
- to come forward with a proposal as to partner universities, institutions and high-level personalities in science and technology to be considered by the University Rector as cooperation partners and/or as members of the Managing Advisory Board
- to implement the evaluation of all courses or modules and examinations of the Course together with the administrative head
- to come forward with a proposal as to establish the criteria and the procedure for admission to the Course, based on the general admission requirements, according to which candidates will be selected and proposed to the Rector of the Medical University of Vienna for admission.
- to establish the criteria and the procedure for assigning available scholarships and monetary awards to course participants. The Scientific Managing Board is also in charge of establishing further norms or regulations, if necessary, and of obtaining sponsorships
- to appoint the managing head of the Course
- to act as the representative of the Course outside the Medical University of Vienna

§ 14 Regulations on the Course Administration

(1) The Scientific Advisory Board shall appoint a manager and representative of the Course.

(2) The managing head shall be in charge of the tasks specified below:

- receiving and confirming applications from prospective participants
- planning interviews with the candidates
- scheduling the academic programme together with the lecturers
- room allocation
- management of the academic programme together with the lecturers
- student assistance
- preparing teaching materials (manuals, scripts, readers), and, if necessary, providing an editorial office to perform these tasks
- assisting the Scientific Advisory Board in the performance of the tasks specified above

§ 15 Lecturers/Teaching Staff

The head of the Course, on behalf of the Rector of the Medical University of Vienna, shall appoint recognized academic staff as lecturers and visiting lecturers. The compensation of the lecturing fees is designated according to the rates budgeted in the financial plan.
§ 16 Scientific and Technical Advisory Board

(1) The members of the honorary Scientific and Technical Advisory Board shall be designated by the Rector of the Medical University of Vienna upon proposal by the Managing Advisory Board.

The Scientific and Technical Advisory Board is in charge of evaluating the curriculum in terms of its up-to-datedness.

(2) The Scientific and Technical Advisory Board shall meet at least once a year and is composed of the following members:

- 1 representative of the Federal Ministry of Health
- 2 representatives of the Austrian Society for Medical Physics (ÖGMP)
- 2 recognized scientists in the field of medical physics

§ 17 Quality Assurance

Based on the guidelines issued by the Medical University of Vienna for ensuring the quality of teaching and training offered by the Course, internal and/or external evaluations shall be carried out, and improvement measures will be taken accordingly.

§ 18 Financing and Tuition Fees

The Course shall be financed out of the tuition fees to be paid by the participants in the Course thus covering at least all costs arising from the Course. The course fee shall be fixed by the Rector of the Medical University of Vienna so as to cover its effective costs in accordance with § 91 paragraph 7 of the Austrian Universities Law (“Universitätsgesetz”/“UG”).

§ 19 Transitional Terms and Regulations

(1) Participants who have not completed the University Course in Medical Physics in accordance with the provisions of the previously valid curriculum at the time of the entry into force of this new curriculum are entitled to complete the Course in Medical Physics in accordance with these regulations by December 31, 2016 (i.e. in accordance with the Information Bulletin (“Mitteilungsblatt”) of the academic year of 2004/2005, issue 26, no. 36, as amended).

(2) If a participant fails to successfully complete the Course by the end of December 31, 2016 as provided in paragraph 1, he/she shall have to continue and complete his/her studies automatically under the provisions specified in the present curriculum as amended.

(3) Alternatively, all participants in the current Course are entitled to voluntarily adopt the current curriculum at any time, and thus to continue and complete their studies under the provisions specified in the present curriculum as amended.