OGMP

Österreichische Gesellschaft
für Medizinische Physik

Regulation on Certification of Medical Physicists and Medical Physics Experts

(RLMPE2016)

Education, Training and Continuous Professional Development for Medical Physicists and Medical Physics Experts

V 1.0

Austrian Society for Medical Physics

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Member of IOMP *(International Organization for Medical Physics),* and EFOMP *(European Federation of Organizations in Medical Physics).*

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Table of Contents

List of Abbreviations

Abbreviation	German term	English term/explanation
AAPM		American Association of Medical Physicists
AgMP	Akademisch geprüfter Medizinphysiker	'Academically qualified medical physicist' [Graduate of the postgraduate university course at the Medical University of Vienna]
AP	Ausbildungspunkt	Education point [Points defined by the ÖGMP as credits for education/training done to achieve qualification as Medical Physicist]
BSSD		Basic Safety Standards Directive
CME		Continuous Medical Education
DGMP	Deutsche Gesellschaft für Medizinische Physik e.V.	German Society of Medical Physics
ECTS		European Credit Transfer System
EFOMP		European Federation of Organisations for Medical Physics
EQF		European Qualifications Framework
FAK	Fachanerkennungskommission (der ÖGMP)	Certification committee of the ÖGMP
FP [note: translation uses 'CPD point']	Fortbildungspunkt	Continuous professional development point [Points defined by the ÖGMP as credits for continuous professional development of Medical Physicists and Medical Physics Experts]
CPD [used in translation only]		Continuous professional development
IAEA		International Atomic Energy Agency
IOMP		International Organisation in Medical Physics
MP		Medical Physicist
MPE		Medical Physics Expert

MR		Magnetic resonance tomography
MSc		Master of Science
MUW	Medizinische Universität Wien	Medical University of Vienna
ÖGMP	Österreichische Gesellschaft für Medizinische Physik e.V.	Austrian Association for Medical Physics
QMP		Qualified Medical Physicist
RLMPE	Richtlinie für die Erlangung der Fachanerkennung als Medizinphysiker und Medizinphysik-Experte der ÖGMP	ÖGMP Regulation on Certification of Medical Physicists and Medical Physics Experts [this document]
SGSMP	Schweizerische Gesellschaft für Strahlenbiologie und Medizinische Physik	Swiss Society of Radiation Biology and Medical Physics
SMP		Specialist Medical Physicist
ULG	Universitätslehrgang an der Medizinischen Universität Wien	[Postgraduate] university course [in medical physics] at the Medical University of Vienna
WHO		World Health Organisation
WP	Weiterbildungspunkt	Advanced training point [Points defined by the ÖGMP as credits for education/training of Medical Physics Experts]

The terms listed above are written in full at the first use and subsequently only the abbreviations are used.

1 Introduction

Many developments, discoveries and methods in medical physics play roles in diagnosis and treatment of diseases and in preservation and restoration of human health. Successful, efficient and competent application of this knowledge in both medical-clinical and preclinical research requires the participation of medical physicists (MP) and medical physics experts (MPE). The areas of application that are covered by this interdisciplinary subject are diverse and include, among others, the application of ionizing radiation (radiotherapy, x-ray diagnostics and nuclear medicine), and non-ionizing radiation (ultrasound, ultraviolet, laser, magnetic resonance tomography) in both diagnostics and therapy. Other relevant subject areas include medical informatics, image analysis, audiology, optics, medical acoustics and management activities. In view of the increasing complexity of the various disciplines, the demand for MP is steadily rising [1,2,3,6]. The important role of MP in radiotherapy, x-ray diagnostics and nuclear medicine is underlined by radiation protection law.

The work of MP or MPE requires specific practical and theoretical knowledge that go beyond the curriculum of a first degree in physics. Therefore, MP and MPE need suitable postgraduate education, advanced training and continuous professional development. Minimum standards for education and training of MP and the advanced training for MPE have been formulated by international organizations such as the World Health Organization (WHO), the International Organization for Medical Physics (IOMP), the European Federation of Organisations for Medical Physics (EFOMP), the American Association of Physicists in Medicine (AAPM) and the International Atomic Energy Authority (IAEA) [4,8,10, 16,17,18,19,20,21].

The present Regulation for Qualifications of MP and MPE of the ÖGMP is based on the recommendations of the European Federation of Organisations for Medical Physics (EFOMP) und der European Guideline on Medical Physics Expert (Radiation Protection No 174) [11,12,13].

In the following, ‘Medical Physicist’ and ‘Medical Physics Expert’ will be used to mean, respectively, the equivalent of the Qualified Medical Physicist (QMP) and the Specialist Medical Physicist (SMP), as these designations are used in the EFOMP Policy

Statement No. 10 [8].

These equivalences are based on the definitions of the European Qualifications Framework (EQF) [10] levels of 7+ for the MP and 8 for the MPE (where 8 is the highest defined educational level).

In order to meet the need for a theoretical education in medical physics in Austria, a six-semester postgraduate university course (ULG) in medical physics was inaugurated at the University of Vienna in 1989 (from 2004 at the Medical University of Vienna (MUW)), and revised to reflect new training requirements in 2014. This six-semester course teaches a full curriculum of theoretical knowledge. Graduates of this course have the title ‘academically qualified Medical Physicist’ (AgMP).

This qualification meets the requirements for theoretical education of medical physicists, and with suitable practical training and work experience, the graduates can progress to the certification as Medical Physicist (ÖGMP). The practical training required by EFOMP is often done by working professionally while taking the university course/ULG.

In order to provide for education and training in medical physics, the ordinary general meeting of the ÖGMP decided in 1993 to institute procedures for education and training in medical physics and for certification by the ÖGMP. These regulations were revised in 2007 to take account of general developments in the education and health systems [16,17].

The present Regulation takes account of the ‘Bologna process’ and the introduction of Bachelor’s and Master’s programmes at Austrian universities [15].

The present Regulation is the basis for certification as ‘Medical Physicist (ÖGMP)’ und as ‘Medical Physics Expert (ÖGMP)’.

President of the ÖGMP	Chairperson of the certification committee

2 Aims

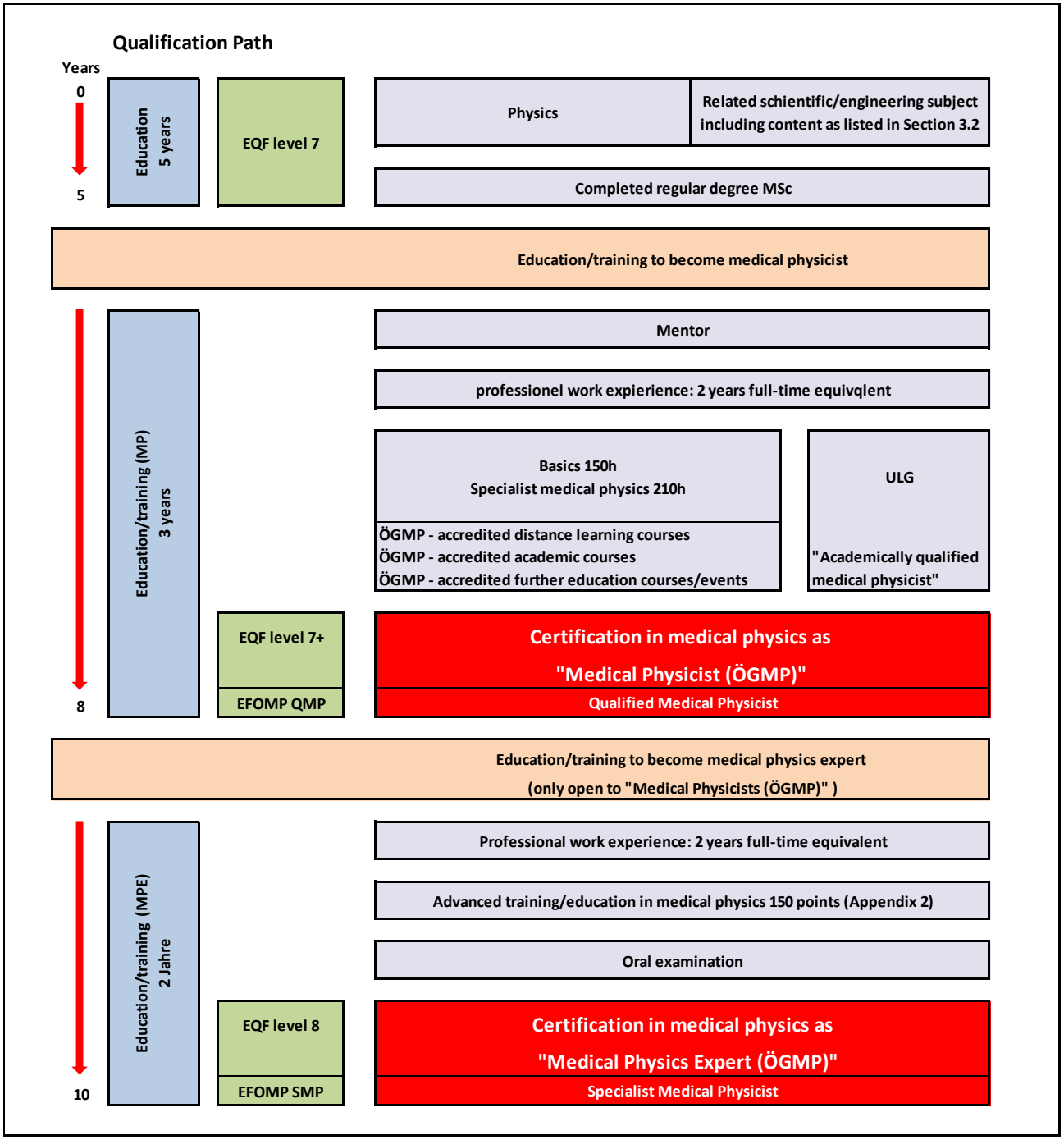
The purpose of the present regulation of the ÖGMP (RLMPE) is to set out the theoretical and practical qualifications of MP and MPE. This should ensure that they are able to carry out their professional tasks independently and on their own responsibility, in collaboration with other medical professions, and to comply with Directive 2013/59/ EURATOM [14].

MP and MPE must acquire practical experience and specialized knowledge in order to be qualified for activities and responsibility in patient care, teaching and research at a high level. Their qualification to do so is defined by the present Regulation of the Austrian Society for Medical Physics for Certification as ‘Medical Physicist (ÖGMP)’ and ‘Medical Physics Expert (ÖGMP)’. Besides this, the regulation is intended to serve as an outline that may be taken into consideration by the Radiation Protection Authority in formulating the official requirements for professional qualifications of MP and MPE.

The paths to qualification set out in the RLMPE define the professional profiles of MP and MPE with the goal of achieving mutual recognition by the corresponding professional organizations DGMP [in Germany] and SGSMP [in Switzerland] and also approval by the EFOMP [4,7,8,9] on the basis of the EC RADIATION PROTECTION NO 174 [11,12,13].

3 Paths to Qualification as ‘Medical Physicist (ÖGMP)’ and ‘Medical Physics Expert (ÖGMP)’

The diagram shows an overview of the education and training scheme for MP and MPE, based on EFOMP recommendations, guidelines of the European Commission for medical physics experts and the corresponding qualification levels according to the European Qualification Framework (EQF).



4 Eligibility, Admission Criteria

The fundamental responsibility for judging whether applicants meet the admission criteria for education in medical physics lies with the certification committee of the ÖGMP (FAK).

The admission process is only open to members of the ÖGMP.

In order to be admitted to the certification process, applicants must produce proof of the following qualifications:

Graduation with the degree ‘MSc’ or equivalent from a regular university degree course at a recognized post-secondary educational institution in Austria or abroad, with at least 300 ECTS, in one of the following subjects:

a. Physics, provided that the applicant can document having taken and achieved passing grades for lectures and tutorials equivalent to 10 ECTS in the area of nuclear and isotope physics. These courses must cover the fundamentals of the phenomenology of nuclear physics and knowledge of elementary particles, including the composition, general characteristics, reactions, and interactions of atomic nuclei (radioactivity and nuclear reactions), and also the accompanying atomic processes; the methods and the most important instruments used to investigate them; and important practical applications in science, medicine and technology.

b. A completed Master's degree in a related scientific or engineering subject, in which case the applicant must document not only having taken courses on nuclear and isotope physics as set out in point a, but additionally the following courses (with at least passing grades):

   (1) Introduction to physics: 20 ECTS.

   (2) 5 ECTS of lectures and tutorials on calculation methods in physics.

(3) 7 ECTS of lectures and tutorials on applied linear algebra.

(4) 8 ECTS of lectures and tutorials on applied analysis.

The subject matter of (1–4) is listed in detail in Appendix 1.

c. Degrees at foreign universities and other third-level institutions outside Austria that are equivalent to the degree courses specified above. The certification committee (FAK) decides on admission [of applicants].

5 Education/Training of Medical Physicists

The theoretical and practical training of MP is supervised by a mentor. It is designed to take **at least three years**, and should not exceed the total duration of 10 years. For certification as a 'Medical Physicist (ÖGMP)', applicants must provide proof of **the equivalent of at least two years of full-time professional practice** in medical physics.

5.1 Mentor

The mentor must be a '**Medical Physics Expert (ÖGMP)'** who is authorized by the FAK to act as a mentor (*see Appendix 4*).

The education and training of MP must be supervised by a mentor.

Graduates of the postgraduate university course 'Medical Physics' and graduates of other recognized training courses must also be supervised by a mentor during their period of professional practice.

The applicant for certification shall name their preferred mentor to the FAK of the ÖGMP and this nomination must then be confirmed by the FAK. Subject to justified exceptions, the mentor should be working at the place of employment of the applicant.

If there is no mentor working at the same place of work as the applicant, the FAK of

the OGMP shall appoint a mentor (applicant has the right to nominate a preferred mentor).

The mentor

- Supports the professional training of the applicant
- Supports the drafting of a training plan
- Evaluates the training
- And writes a final report to the FAK when the training is completed.

5.2 Theoretical Education for Medical Physicists

For certification as a 'Medical Physicist (ÖGMP)' applicants must provide **proof that they have taken at least 360 hours** of relevant courses. One hour in this sense is understood as a teaching period of 45 minutes. These are classified under the 19 sections of the content catalogue *(Appendix 2)* and take the form of

1. The postgraduate university course 'Medical Physics' at the Medical University of Vienna

or

2. ÖGMP-accredited courses, and part-time courses taken while working, in medical physics
3. ÖGMP-accredited educational & training events
4. ÖGMP-accredited distance learning and e-Learning: IT-based learning system (with success monitoring)

Approval of training courses by the ÖGMP is done by the FAK as set out in *Appendix 5*.

The necessary knowledge includes:

a. **A minimum of 150 hours of fundamental principles** in the following areas (N1-N5):

- Anatomy
- Physiology
- Biophysics
- Biomathematics
- Biomedical engineering
- Hospital organisation
- Radiation biology
- Radiation protection

and

b. A minimum of 210 hours of specialist courses in medical physics in the following areas:

- advanced knowledge and practical experience in a clinically relevant subdiscipline of medical physics (Appendix 2, N6–N13).
- knowledge of the fundamentals and general principles of two (at most three) further subdisciplines of medical physics (Appendix 2, N6–N19)

Of these, **at least 240 hours must be completed** at educational institutions as defined, **which include written or oral examinations.**

In the area of radiation protection, the basic course and at least one specialized course for radiation safety officers in accordance with radiation protection law must be chosen.

Graduates of the postgraduate university course in Medical Physics at the Medical University of Vienna are deemed to have the knowledge required by this section.

5.3 Practical Training of Medical Physicists

For certification as a ‘Medical Physicist (ÖGMP)’ proof of **at least the equivalent of two years' full-time practical professional work experience** must be provided.

Practical professional work may be paid employment (e.g. regular employment or an externally-funded research position) or also unpaid work (e.g. job shadowing with involvement in the work process throughout the full working time) in medical physics. The content of the work done is to be agreed with the mentor.

Work periods of less than three months

Whether it is possible to recognize work periods of less than three months shall be decided by the FAK individually.

Work periods that are more than ten years in the past at the time of application

Whether it is possible to recognize work periods that lie more than ten years in the past at the time of application shall be decided by the FAK individually.

Interruptions of Training

Interruptions of the training, e.g. due to illness, parental leave, or special leave, extend the time limit for completing the training. This applies only to interruptions which amount in total to more than three months in a calendar year.

Part-Time Employment

If the applicant is employed part-time, the time limit for completing the training is extended proportionally (full-time equivalence).

6 Training of Medical Physics Experts

The theoretical and practical training of ‘Medical Physics Experts (ÖGMP)’ is designed to take at least two years.

To obtain certification as a ‘Medical Physics Expert (ÖGMP)’ the applicant must provide proof of

a) Certification as a ‘Medical Physicist (ÖGMP)’,

b) A further period of at least the equivalent of two years full-time work as a ‘Medical Physicist (ÖGMP)’,

c) **At least 150 advanced training points** (WP) from the training and education options in medical physics listed in *Appendix 3 Point 3.1*, such that

- the full-time work equivalent can be counted for 50 WP per year and a maximum of 100 WP in total
- and at least 20 points from Appendix 3 (A 3.1) must be from Category 3, with the condition that in categories 3a and 3b only a first-author publication or scientific lecturing can be counted.

d) A positive result of the oral examination (see 8.2.)

7 Certification Process for ‘Medical Physicist (ÖGMP)’

7.1 Admission to the Certification Process

The certification process for ‘Medical Physicist (ÖGMP)’ is initiated by an application to the FAK of the ÖGMP and is only open to members of the ÖGMP.

The application for the beginning of training can be obtained from the website of the ÖGMP and should be addressed to the FAK of the ÖGMP (www.oegmp.at).

The application must be accompanied by the following documents:

1. Curriculum vitae
2. Degree certificates for first degree and if applicable, doctoral degree
3. Supplementary documentation of eligibility for admission
4. Proposed place(s) of training and areas of expertice
5. Proposed mentor
6. Plan for part-time training to be taken while working

Point 3 does not apply if the applicant is approved for the ULG. Points 4 to 6 are to be agreed with the future mentor.

The FAK of the ÖGMP evaluates whether the admission conditions are met based on the submitted documents, requests additional [material] if necessary and decides what credits can be given for education and training.

NOTE: Degrees and diplomas from universities outside Austria can be recognized if they are equivalent to the University Course in Medical Physics in Vienna. The FAK is responsible for deciding on the recognition of foreign qualifications.

The FAK of the ÖGMP also evaluates whether the training programme chosen by the applicant is compatible with the ÖGMP regulations. It accepts the training programme, possibly proposing amendments. The FAK also checks individual parts of the applicant's professional experience to ensure they are compatible with the requirements set out in the basic principles.

7.2 Progress of the Training

The training is to be completed according to the training programme submitted to the FAK. The FAK of the ÖGMP must be notified without delay of any changes. The FAK will take all decisions in the course of an applicant's certification procedure in consultation with the mentor. If no agreement is reached, the decision of the FAK of the ÖGMP is final. The decision is explained to the applicant.

7.3 Application for Certification as ‘Medical Physicist (ÖGMP)’

Applications for the ÖGMP certification as a ‘Medical Physicist (ÖGMP)’ can be submitted to the FAK of the ÖGMP after completion of training and at the earliest 3 years after the beginning of training. The application must be confirmed by the mentor.

The application for certification as a ‘Medical Physicist (ÖGMP)’ can be obtained from the website of the ÖGMP and should be addressed to the FAK of the ÖGMP (www.oegmp.at).

The application must include:

1. The written request for certification
2. Records of the part-time training*
3. Proof of the nature and scope of the professional work experience
4. Proof of payment of the administration fee and the annual membership fees.
5. Final report of the mentor

* In the case of graduates of the postgraduate university course in ‘Medical Physics’ at the Medical University of Vienna, the diploma of the course is accepted as proof of training.

If all conditions are met, the certification as a ‘Medical Physicist (ÖGMP)’ is issued in accordance with *Appendix 7*. This certificate entitles the holder to use the title ‘Medical Physicist (ÖGMP)’.

For the processing of the application, a fee to the amount of **three times the membership fee of an ordinary member** is charged.

8 Certification Process for ‘Medical Physics Expert (ÖGMP)’

The certification process is only open to members of the ÖGMP.

8.1 Application for Certification as a ‘Medical Physics Expert (ÖGMP)’

The ÖGMP certification as a ‘Medical Physics Expert (ÖGMP)’ is to be applied for from the FAK of the ÖGMP after completion of advanced training.

The application for certification as a ‘Medical Physics Expert (ÖGMP)’ can be obtained from the website of the ÖGMP and should be addressed to the FAK of the ÖGMP (www.oegmp.at).

The application must include:

1. The written request for certification as a ‘Medical Physics Expert (ÖGMP)’
2. Proof of the certification as a ‘Medical Physicist (ÖGMP)’
3. Documentation of the type and scope of professional work experience since certification (ÖGMP).
4. Proof of completion of the education and training measures in medical physics listed in *Appendix 3* corresponding to at least 150 advanced training points (WP) as defined in Section 6.
6. Proof of payment of the administration fee and the annual membership fees.

The FAK of the ÖGMP evaluates whether the conditions have been met and if necessary, requests additional documentation.

If all conditions are met, the FAK of the ÖGMP nominates **three examiners** for the oral examination and names them to the applicant along with the invitation to the examination.

For the processing of the application, a fee to the amount of **three times the membership fee of an ordinary member** is charged.

8.2 Oral Examination

For the oral examination, the FAK appoints three examiners, generally two ‘Medical Physics Experts (ÖGMP)’ and one member of the FAK of the ÖGMP and announces the date and time of the examination. If necessary, the FAK can invite additional persons. The oral examination is held preferably in German and is usually held during the annual conference of the ÖGMP.

At least 1 month before the oral examination, the applicant is notified of three topics from the field in which they work.

The applicant should be able to give an extemporary presentation on one of these topics, chosen by the examiners, lasting approximately 20 minutes. Following this, the applicant should answer questions on their field of work, including questions that go beyond the 3 notified topics, in an interview with the examiners. The oral examination lasts 45 minutes.

When the applicant has passed the oral examination, the minutes of the examination are archived by the FAK and the FAK confers the certification as a ‘Medical Physics Expert (ÖGMP)’ and issues the certificate ‘Medical Physics Expert (ÖGMP)’ in accordance with *Appendix 8*. This confers on the applicant the right to use the title ‘Medical Physics Expert (ÖGMP)’.

If certification is refused, the examiners explain the reasons for this to the applicant. The applicant can appeal to the FAK against the decision. If no agreement is reached, the executive committee of the ÖGMP decides.

A failed oral examination can be repeated. In the event of a failed oral examination, the applicant must wait for half a year before applying for a repeat examination.

9 Period of Validity of Certification of ‘Medical Physicists (ÖGMP)’ and ‘Medical Physics Experts (ÖGMP)’

The certification as a ‘Medical Physicist (ÖGMP)’ or ‘Medical Physics Expert (ÖGMP)’ is **valid for a fixed term of five years.**

Applications for renewal of the certification can be submitted to the FAK of the ÖGMP at the earliest half a year before expiry.

10 Renewal of Certification for ‘Medical Physicists (ÖGMP)’ and ‘Medical Physics Experts (ÖGMP)’

The certification is renewed for a further five years if the holder

1. has worked professionally for the **equivalent of at least two years of full-time work** in the field of medical physics

and

2. provides proof of completion of **CPD corresponding to 250 CPD points** during the relevant period.

For the documentation of CPD, the points scheme defined in *Appendix A 3.2* applies.

The approval of CPD courses/events by the FAK of the ÖGMP is regulated as set out in *Appendix 5 Point 5.3*.

In the event of interruptions of work, e.g. for illness, parental leave or special leave, an application can be made to the FAK to extend the period for gathering the CPD. This applies only to interruptions of a total of more than three months. The FAK of the ÖGMP decides on the application and if appropriate confirms an extension of the existing certification.

In the event of refusal of the application, the applicant is informed of the reasons. The FAK can set an additional deadline for the applicant to fulfil the requirements.

10.1 Application for Renewal of Certification as a ‘Medical Physicist (ÖGMP)’ or ‘Medical Physics Expert (ÖGMP)’

Applications for renewal of certification as a ‘Medical Physicist (ÖGMP)’ or ‘Medical Physics Expert (ÖGMP)’ should be submitted to the FAK of the ÖGMP.

The application must include:

1. The written request for renewal of the certification as ‘Medical Physicist (ÖGMP)’ or ‘Medical Physics Expert (ÖGMP)’
2. The valid existing certificate of the ÖGMP
3. Documentation of the type and scope of professional work since the original certification (ÖGMP) or the last renewal
4. Proof of CPD corresponding to 250 FP
5. Proof of payment of the administration fee and the annual membership fees.

For the processing of the application, a fee to the amount of **three times the membership fee of an ordinary member** is charged.

The FAK of the ÖGMP evaluates whether the conditions are met and requests supplementary materials if necessary.

If all conditions are met, a new certification as a ‘Medical Physicist (ÖGMP)’ or ‘Medical Physics Expert (ÖGMP)’ is issued in accordance with *Appendices 7* and *8*. This certificate entitles the holder to use the title ‘Medical Physicist (ÖGMP)’ for a further period of 5 years.

11 Dormancy and Disqualification

After expiry of the certification period, the certification is automatically made dormant.

On receiving an application for renewal after a certification has become dormant, the FAK decides on the further procedure.

In the event that a disciplinary body or a court makes a finding of serious misconduct against a ‘Medical Physicist (ÖGMP)’ or ‘Medical Physics Expert (ÖGMP)’, their certification can be cancelled by the executive committee of the ÖGMP on the recommendation of the FAK.

12 Membership of the Certification Committee of the ÖGMP

The FAK of the ÖGMP consists of three to five members. These are appointed by the executive committee of the ÖGMP. Their regular period of office is four years; subsequent re-nomination is allowed. The executive committee of the ÖGMP chooses the chairperson; he or she manages the business of the committee. The FAK of the ÖGMP takes decisions by simple majority. In the event of a tied vote, the casting vote of the chairperson decides.

13 Recognition of Foreign Certifications

Assessments of equivalence of certifications from other countries to the ÖGMP certification are made by the FAK of the ÖGMP. If necessary, the FAK stipulates additional requirements in order to ensure that equivalence is reached. The FAK decides on the level of qualification.

The FAK of the ÖGMP shall recognise the certifications of other countries that conform to the currently valid version of the EFOMP guidelines as equivalent, provided that the admission criteria as set out in Section 4 are met and the applicant's [history of] education, training and CPD comply with these ÖGMP regulations.

14 Transitional Arrangements

Applications for certification that are submitted before this Regulation comes into effect but have not yet been decided on, can be processed according to this new Regulation at the request [of the applicant].

Applicants who have already applied for admission to the certification process, but whose certification has not yet been completed at the time when this Regulation comes into effect, have the right to have their application processed according to the previous regulations provided that the process is completed within three years after the date when this Regulation comes into effect.

Medical physicists certified by the ÖGMP under previous regulations may continue to use the title ‘Medical Physicist (ÖGMP)’.

Medical physicists who are already certified by the ÖGMP at the time that this Regulation comes into effect can submit an application for certification as ‘Medical Physics Experts (ÖGMP)’ within two years after this Regulation comes into effect, provided they meet the advanced training requirements Section 6 (a–c). An appropriate request should be submitted to the FAK including the proofs of such training.

Medical physicists who were approved as mentors at the time when this Regulation comes into effect may continue, as ‘Medical Physicists (ÖGMP)’, to act as mentors, for two years subsequent to the Regulation coming into effect. After the expiry of this transitional period, only Medical Physics Experts will be allowed to act as mentors.

15 Amendment of the Regulation

Any amendment of this Regulation requires the support of a majority of votes cast at an ordinary general meeting of the ÖGMP. A motion for the amendment must be published in the agenda of the meeting in compliance with the applicable deadline.

16 Withdrawal of the Regulation

This regulation can be withdrawn by a resolution of the ordinary general meeting of the ÖGMP with a two-thirds majority.

17 Effective Date

This Regulation in the present form shall come into effect on 01.12.2016 (resolution of the ordinary general meeting of the ÖGMP on 09.06.2016).

Appendix 1: Admission Requirements for Graduates with a Master’s Degree in a Science or Engineering Subject Related to Physics

For admission to the certification process, Master’s graduates of a science or engineering subject related to physics must provide proof of having taken and passed courses in the following subject areas:

(1) Introduction to Physics: 20 ECTS.

Proof of lectures, calculation exercises und demonstration tutorials (with integrated examinantions) on the fundamental principles of mechanics and physics of heat. These must include: mechanics of point masses and rigid bodies, elasticity, friction, statics and dynamics of fluids, oscillations and waves, temperature, ideal and real gases, phase diagrams, entropy, laws of thermodynamics, thermal conduction, thermodynamic cycles, electrostatics, condensers, dielectric polarization, direct current, alternating current, electrical resistance, electrical conduction in gases, liquids and solids, magnetostatics, magnetic properties of materials, induction, alternating current circuits, electromagnetic oscillations and waves, Maxwell’s equations, wave optics, geometrical optics, optical instruments, elements of relativity theory.

(2) Nuclear and Isotope Physics: 10 ECTS.

Fundamentals of phenomenology of nuclear physics including knowledge about fundamental particles. Composition, general characteristics, reactions and interactions (radioactivity and nuclear reactions) of atomic nuclei (including the related atomic processes), the methods and most important instruments used to investigate them, and important practical applications in science, medicine and technology.

(3) 5 ECTS from lectures and tutorials on calculation methods in physics

Including: functions, vectors, differentiation, integration, Taylor series, complex numbers, error analysis differentiation of fields, integration of fields, ordinary differential equations.

(4) 7 ECTS from lectures and tutorials on applied linear algebra

Including: elementary vector calculation – vectors in planes and in three dimensions, vector addition, scalar products, vector products, notation of theoretical physics (sum conventions, Kronecker symbol); concept of the vector space (over R or C); fundamental principles of linear independence and dependence, partial space, base; matrices; linear representations, matrix representation, ker, im, linear functional, dual space; linear equation systems, Gauss elimination; determinants; Eigenvalues, Eigenvectors, characteristic polynomial.

(5) 8 ECTS from lectures and tutorials on applied analysis.

Including: terminology of set theory; natural numbers, rational numbers, real numbers, complex numbers, field axioms; real number series, convergence, limited and unlimited set of real numbers; functions, continuous functions, limits; transcendental functions, trigonomic functions, logarithms, exponential functions (real and complex), differential and integral calculus.

Appendix 2: Content Catalogue

Areas of work that cannot be grouped into the clinical fields are subject to the decision of the FAK when the applicant registers at the beginning of training. For this purpose the applicant has to submit a profile and structure of their work activities.

The content catalogue should be used as a guide for designing the contents of study programmes in medical physics, part-time courses, advanced training and CPD.

The content catalogue allows sufficient freedom to select and structure course contents. Some topics, such as fundamental principles, image analysis, quality assurance and technical safety are listed in multiple sections of the content catalogue.

Area A – Basics

N1. Anatomy and physiology

N1.1 Principles of medical terminology

N1.2 Cell and metabolism

N1.3 Skeleton and muscle system - ligaments, tendons and joints

N1.4 Heart and circulation

N1.5 respiratory system

N1.6 digestive organs

N1.7 prostatitis

N1.8 Endocrine system

N1.9 Blood and blood-forming organs N1.10 Brain and nervous system

N1.11 Sensory organs

N1.12 Skin

N2. Biophysics and biochemistry

N2.1 Principles of molecular biology

N2.2 nucleic acids

N2.3 Amino acids, proteins (including structure elucidation) N2.4 Nutrition and vitamins, enzymes, coenzymes

N2.5 Intermediate metabolism and biological oxidation

N2.6 Physics of sense organs, neuro-biochemistry

N2.7 Biophysics and biochemistry of the cell

N2.8 Methods of cytometry

N2.9 Substance exchange by membranes, exo- and endocytosis

N2.10 Signal transduction at the cellular level

N3. Biomathematics and computer science

N3.1 Principles of Probability Theory

N3.2 Descriptive statistics

N3.3 Point and interval estimation

N3.4 Statistical tests (parametric, parameter-free, variance analysis)

N3.5 Analysis of survival times

N3.6 regression

N3.7 Test planning, power analysis

N3.8 Sensitivity, specificity of diagnostic procedures and predictive value

N3.9 Basic concepts of information theory

N3.10 Medical information systems and data protection

N3.11 Basic concepts of digital signal processing

N3.12 Fundamentals of digital image processing

N4. Medical technology

N4.1 Biosignal detection (EEG, ECG, EMG biomagnetic signals) N4.2 Patient monitoring and monitoring

N4.3 Endoscopy in diagnostics and therapy

N4.4 Respiration, narcosis and resuscitation

N4.5 cardiac support (heart-lung machine, heart pacemaker, artificial heart)

N4.6 Treatment with electrical current (stimulatory therapy, diathermy, bloodstill, surgery)

N4.7 dialysis

N4.8 Prostheses and orthoses

N4.9 Infusionstechnik

N4.10 Ultrasonic diagnosis and ultrasound therapy

N4.11 Laser in diagnostics and therapy

N4.12 Legal requirements (rules, regulations, technical safety standards)

N4.13 Calibration

N4.14 Quality assurance (legal basis, terms and definitions, quality management procedures in health care)

N5. Organizational and legal principles in health care

N5.1 Health care structure

N5.2 Organizational structure of hospitals and medical institutions

N5.3 Job profiles and responsibilities of hospital workers, legal requirements

N5.4 Hospital company organization (administrative, organizational,
guidelines)

N5.5 Legal issues
N5.6 Quality Assurance and Certification
N5.7 Documentation and archiving
N5.8 Basic Course Radiation Protection
N5.9 Special Course Radiation Protection "X-ray Diagnostics"
N5.10 Special Course Radiation Protection "Open radioactive substances"
N5.11 Special Course Radiation Protection "Radiotherapy"
N5.12 Introduction to the “Medizinproduktegesetz“ and the „Medizinproduktebetreiber-verordnung“

Area B - Special and optional areas

N6. Radiotherapy
N6.1 Physical Basics of Radiation Therapy
N6.2 Biological Basics of Radiation Therapy
N6.3 Dosimetry of ionizing radiation, method for dosimetry, clinical dosimetry
N6.4 Procedure for the calculation of dose and dose distribution
N6.5 Radiotherapy for percutaneous and brachytherapy
N6.6 Indications for radiation therapy, dosage for various diseases and
tumor sites
N6.7 Methods of tumor localization
N6.8 Radiation planning and simulation, optimization of the dose distribution in the body and
Application of biological models
N6.9 Radiation techniques to achieve specific dose distributions in the body
N6.10 Irradiation Field Verification Techniques and Therapy Image Procedures
N6.11 Quality assurance including verification and logging systems
N6.12 Radiation protection of the patient and the personnel
N6.13 Planning and setting up radiotherapy departments

N7. Nuclear medicine
N7.1 Physical Basics of Nuclear Medicine
N7.2 Radiation Measurement and Dosimetry
N7.3 Production of radionuclides (cyclotron, reactor, generator)
N7.4 Basic principles of nuclear medicine diagnostics and therapy (radiopharmaceuticals)
N7.5 Biological Radiation and Toxicity of Radioactively-labeled Substances
N7.6 Biokinetics of radioactive substances, determination of organdoses
N7.7 Planar gamma camera systems

N7.8 Emission tomography with gamma rays (SPECT)
N7.9 Positron Emission Tomography (PET)
N7.10 Data collection and processing in nuclear medicine; Networking
N7.11 In vivo screening methods
N7.12 In vitro diagnostics
N7.13 Nuclearmedical therapy and intratherapeutic dosimetry
N7.14 Quality control and quality assurance
N7.15 Radiation protection of the patient and the personnel
N7.16 Planning and setting up nuclear medical departments

N8. Diagnostic Radiology
N8.1 Generation and properties of X-rays
N8.2 X-ray examination methods and equipment
N8.3 Characteristics of analogue and digital picture-receiver systems
N8.4 Physical parameters of the imaging system and image quality
N8.5 Digital imaging, processing and documentation in sectional and projection radiography
N8.6 Interventional radiology
N8.7 Quality assurance and quality control measures
N8.8 Dosimetry in x-ray diagnostics, diagnostic reference values, CTDI
N8.9 Radial exposure of patients and personnel, dose estimation in pregnant women
N8.10 Special features of pediatric X-ray diagnostics
N8.11 Technical and organizational radiation protection
N8.12 Planning and setting up of X-ray diagnostics departments

N9. Clinical Audiology
N9.1 Physical, medical, psychological and special pedagogical foundations
N9.2 Psychophysics of hearing and perception
N9.3 Psychoacoustical methods of audiometry: sound, speech and overwell audiometry
N9.4 Impedance measurement at the center hole
N9.5 Acoustically and electrically evoked potentials
N9.6 Otoacoustic emissions
N9.7 Diagnosis and therapy of communication disorders in infancy and childhood
N9.8 Noise abatement and their prevention
N9.9 Supply of hearing aids and cochlear implants
N9.10 Rehabilitation of hearing-impaired: hearing-related communication disorders, multimodal activities
N9.11 Neurootology, Vestibular Diagnosis

N9.12 Quality Assurance and Organizational Aspects

N10. Clinical applications of lasers

N10.1 Physical fundamentals of quantum electronics and electrooptics

N10.2 production of laser radiation, physical and technical data of the most important laser

N10.3 Laser Radiation Measurement

N10.4 Laser protection in the clinic

N10.5 Optical transmission systems

N10.6 Interactions of laser radiation with biological tissue

N10.7 Laser spectrometry and dosimetry of medical laser applications

N10.8 Clinical-therapeutic laser applications

N10.9 Clinical-diagnostic laser applications

N11. Clinical-medical optics

N11.1 Physiology and Psychophysics of Seeing

N11.2 Theory of imaging systems

N11.3 Ophthalmic optics

N11.4 View at work and in traffic

N11.5 Optical measurements on the patient

N11.6 Diagnostic and therapeutic laser applications

N11.7 Radiation protection (infrared, UV, laser)

N12. Clinical use of ultrasound

N12.1 Sound emission and reception

N12.2 Sound propagation in tissue

N12.3 Imaging after pulse switching: A, B and M image

N12.4 Endoscopic methods

N12.5 Measurement of blood flow: Doppler method, "Color Velocity Imaging"

N12.6 tissue characterization

N12.7 Ultrasonic computer tomography

N12.8 Quality assurance: test objects and tissue phantoms

N12.9 Biological effects of ultrasound

N12.10 Therapeutic and surgical applications

N12.11 Safety aspects in diagnostic applications

N12.12 Ultrasonic exposure and dosimetry

N13. Clinical Application of Magnetic Nuclear Resonance

N13.1 Nuclear and electron spin in the magnetic field
N13.2 Nuclear magnetic resonance
N13.3 Relaxation processes and mechanisms
N13.4 Experimental methods of MR (stationary, pulse methods)
N13.5 MR technology (magnet, gradient, HF components)
N13.6 Magnetic resonance imaging (MRI)
N13.7 Parameter-selective MRI (density, relaxation, diffusion, flow)
N13.8 Functional MRI
N13.9 Chemical shift, spin-spin coupling and MR spectroscopy
N13.10 In vivo MR spectroscopy (MRS)
N13.11 MR spectroscopy of body fluids
N13.12 Quality assurance
N13.13 Erection of MRI systems

N14. Physical Measurement Techniques in Medicine
N14.1 Mechanical, thermal, electrical and optical measurements
N14.2 Sensors, measuring arrangement
N14.3 Automation and process control for measuring operations
N14.4 Electronic techniques for signal processing
N14.5 Digitization, data compression, interfaces
N14.6 Filtering, averaging
N14.7 Signal analysis (e.g., correlation and transformation techniques, extraction of characteristic parameters)
N14.8 Evaluation and error analysis
N14.9 Presentation and documentation of results
N14.10 Patient safety during physical measurements

N15. Medical Acoustics
N15.1 Physical principles of acoustics
N15.2 Generation, propagation, measurement and evaluation of sound
N15.3 Processing and analysis of acoustic signals
N15.4 Acoustics and diagnostics of voice and speech
N15.5 Noise control, sound insulation and sound damping
N15.6 Room and building acoustics
N15.7 Electroacoustics N15.8 Ultrasound
N15.9 Infrared
N15.10 Shock waves

N15.11 Special acoustic measurement methods (e.g., photoacoustic measurements) N15.12 General and special equipment

N16. Physiological optics and lighting technology

N16.1 Physiology and Psychophysics of Vision N16.2 Theory of Image Systems

N16.3 Light technology, photometry

N16.4 Infrared and UV techniques

N16.5 endoscopy, beam guidance system, optical fiber technology

N16.6 Microscopic methods

N16.7 Optical spectroscopy

N17. Imaging and image processing in medicine

N17.1 Basic concepts of imaging procedures

N17.2 Data Collection and Privacy

N17.3 Digitization of the image information

N17.4 Mathematical Methods of Image Transformation

N17.5 Digital filtering

N17.6 Gray value distribution, statistical parameters

N17.7 Texture and pattern recognition

N17.8 Reconstruction methods and visualizations

N17.9 3D and 4D representations

N17.10 Interactive image analysis

N17.11 Image representation, pseudo-colors

N17.12 Image transmission and networking techniques

N17.13 Characteristics of image quality, test methods

N17.14 Image errors, artefacts

N17.15 Standard protocols of digital image communication, data compression

N17.16 Systems of digital image archiving

N18. Physical medicine

N18.1 Manual medicine

N18.2 Basic principles of physiotherapy, massage, occupational therapy

N18.3 Function of muscle and skeletal system

N18.4 Biomechanics of motion apparatus

N18.5 Ergometry, stress ECG

N18.6 Electrophysiology of nerve and muscle cells

N18.7 Electrodiagnosis, therapy

N18.8 ECG, EMG

N18.9 Interaction of electromagnetic radiation with the organism

N18.10 Ultrasonic therapy

N18.11 Phototherapy (IR, visible light)

N18.12 Interaction of ionizing radiation with the organism

N18.13 Hydro, cryo, thermotherapy

N18.14 Hyperthermia applications

N18.15 IR thermography

N18.16 Biomechanical measurement methods

N18.17 Measurement methods in medicine

N19. Radiation protection in medicine

N19.1 Legislation in the field of radiation protection

N19.2 Fundamentals of Radiation Biology

N19.3 Ionizing and non-ionizing radiation sources

N19.4 Measuring instruments and dosimetry in radiation protection

N19.5 Technical and organizational radiation protection

N19.6 Beam exposure of patients and personnel

N19.7 Dosimetry and dose estimation in X-ray diagnostics, nuclear medicine and radiotherapy

N19.8 Special features of medical radiation protection in pediatric applications

N19.9 Protective measures in X-ray diagnostics

N19.10 Protective measures for the operation of X-ray devices and other radiation devices for therapy, as well as for the handling of enclosed radioactive substances

N19.11 Precautions for handling open radioactive materials

N19.12 Contamination, decontamination, whole body measurements and precipitation analyzes

N19.13 Collection, temporary storage and disposal of radioactive waste

N19.14 Quality control and quality assurance

N19.15 Constructional radiation protection

N19.16 Hazards and protective measures for MRI

N19.17 Hazards and protective measures for laser applications

Appendix 3: List of points for the evaluation of training and Continuous Professional Development

A 3.1 List of points for evaluating further training

Category.	Type of training	Credit Points	Comment
1	a) Training with conceptual intended participation of each participant (courses, workshops, tutorials, etc.)	1 point per training hour (45 min)	Previous certification and the number of points to be credited by the FAK. Max. 8 points / day or 4 points per 1/2 day
	b) Frontal lectures with discussion	1 point per lesson (45 min)	max. 8 points / day e.g. 4 points / ½ Tag
	c) National and international congresses	8 CP / day or 4 CP/ halfday	Participation certificate mandatory. max. 40 points / year
2	a) Local, in-house continuing education including introduction of new technologies	Package 15 points per year	no individual proof
	b) Structured interactive lessions via Internet, CD-ROM, qualified journals with written evaluation of learning success	1 point / exercise unit	max. 10 points / year
	c) Self-study (literature and books, teaching materials) without learning success control	Package 10 points per year	no individual proof
	d) Internship for further education in a recognized institution	4 points / day	max. 20 points / year
	e) Acting as a mentor for Medical Physics according to the RLMPE	Flat rate 5 points per candidate	max. 10 points / year
3	a) scientific publications in reviewed journals or textbook contribution	10 points per publication	max. 30 points / year
	b) Other scientific contributions as author, co-author or speaker	5 points per contribution or presentation	max. 15 points / year
	c) Participation as a member in an expert team, committee	3 points per committee per year	max. 10 points / year
	d) Subject-specific teaching	5 points per semester week hour (15 lessons)	max. 20 points / year

Appendix 4: Authorization of Mentors

The authorization to act as a mentor is issued on application by the person wishing to become a mentor. The application should be addressed to the FAK. The following documents must be submitted with the application:

a. The certificate conferring the status of ‘Medical Physics Expert (ÖGMP)’
b. Description of knowledge and experience the applicant has acquired in a field of medical physics (see *Appendix 2)*.

After evaluating the documents submitted by the applicant, the FAK decides on the authorization and issues it.

The authorization to act as a mentor expires with the certification as a Medical Physics Expert or at the request of the holder.

Appendix 5: Criteria for the Approval of Educational and Training Courses and Events

A 5.1 Courses/Events for Training and Education to qualify as Medical Physicist

The application for ÖGMP accreditation of educational and training courses/events in medical physics can be obtained from the website of the ÖGMP () and should be addressed to the chairperson of the **FAK** of the ÖGMP, naming the subject area.

On application, the **FAK** evaluates whether the courses/events are suitable as part of the education [of medical physicists]. Courses/events that are organized by, or in cooperation with, the ÖGMP or an equivalent national or international professional society are generally accredited.

Courses at tertiary educational institutions are deemed to be recognized if at least 80% of their contents correspond to the content catalogue (Appendix 2) and the teaching time of the postgraduate University Course in Medical Physics.

When the certification committee decides to accredit a course/event, it defines

1. The number of **education points** and
2. The **subject areas** (**Appendix 2: Content Catalogue**)

No multipliers are applied to hours of courses in this category.

A 5.2 Advanced Training Courses/Events

The application for ÖGMP accreditation of courses/events for advanced education and training [to qualify as medical physics experts] can be obtained from the website of the ÖGMP (www.oegmp.at) and should be addressed to the chairperson of the **FAK** of the ÖGMP.

On application, the **FAK** evaluates whether the courses/events are suitable as part of advanced education and training [towards qualification as medical physics experts]. Courses/events that are organized by, or in cooperation with, the ÖGMP or an equivalent national or international professional society are generally accredited.

When the certification committee decides to accredit a course/event, it defines a number of **advanced training points** for the course/event.

No multipliers are applied to the hours of courses in this category.

A 5.3 CPD Courses/Events

The application for ÖGMP accreditation of courses/events for CPD in medical physics can be obtained from the website of the ÖGMP () and should be addressed to the chairperson of the **FAK** of the ÖGMP.

On application, the **FAK** evaluates whether the courses/events are suitable for the CPD of medical physicists. Courses/events that are organized by, or in cooperation with, the ÖGMP or an equivalent national or international professional society are generally accredited.

When the certification committee decides to accredit a course/event, it defines a number of **CPD points** for the course/event.

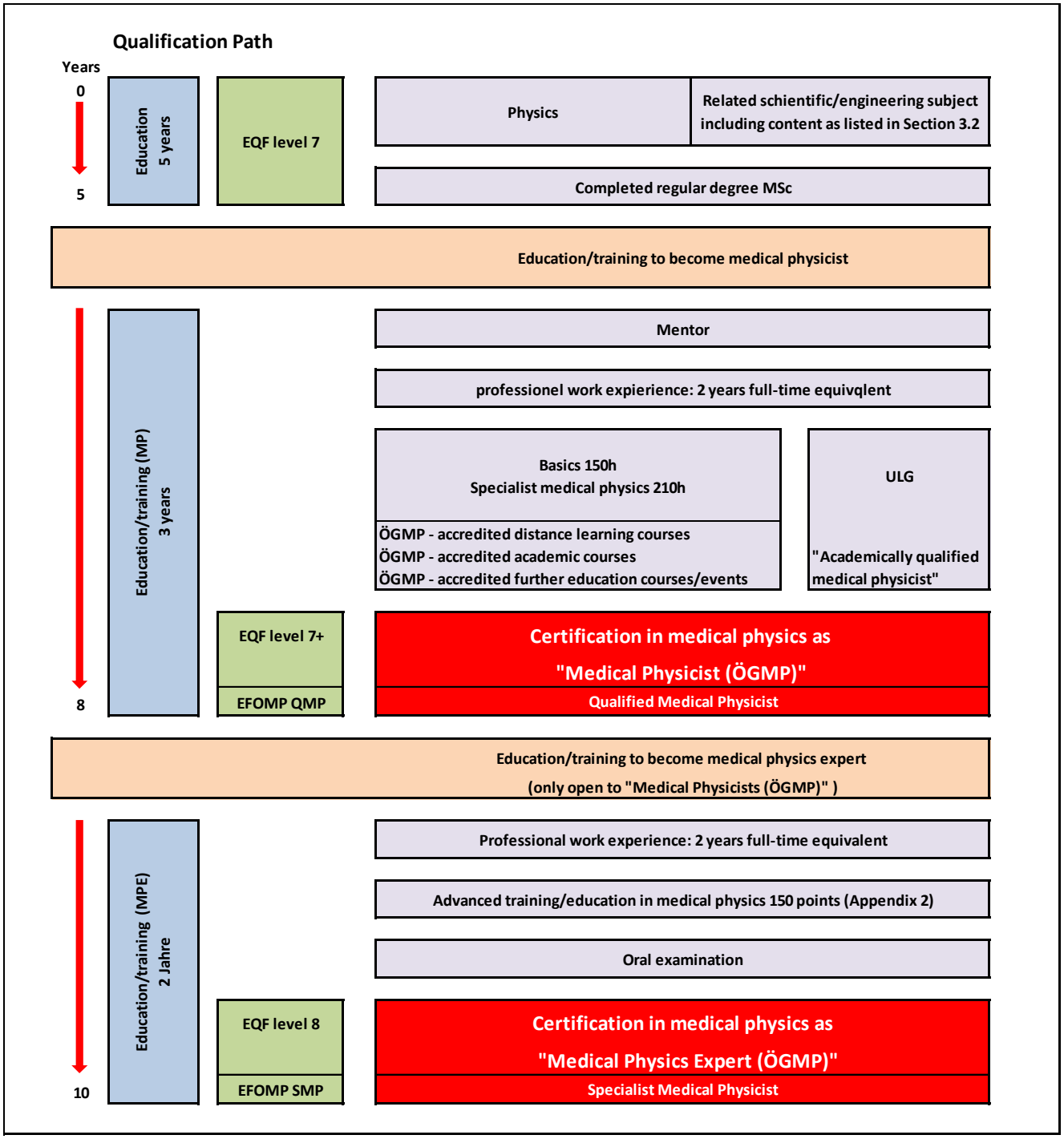
The CPD points for a course/event are multiplied by a factor of 1.5 if proof of success in an examination at the end of the course/event is supplied.

A 5.4 Certificates of Participation

Documents confirming participation in a course/event must include the following information:

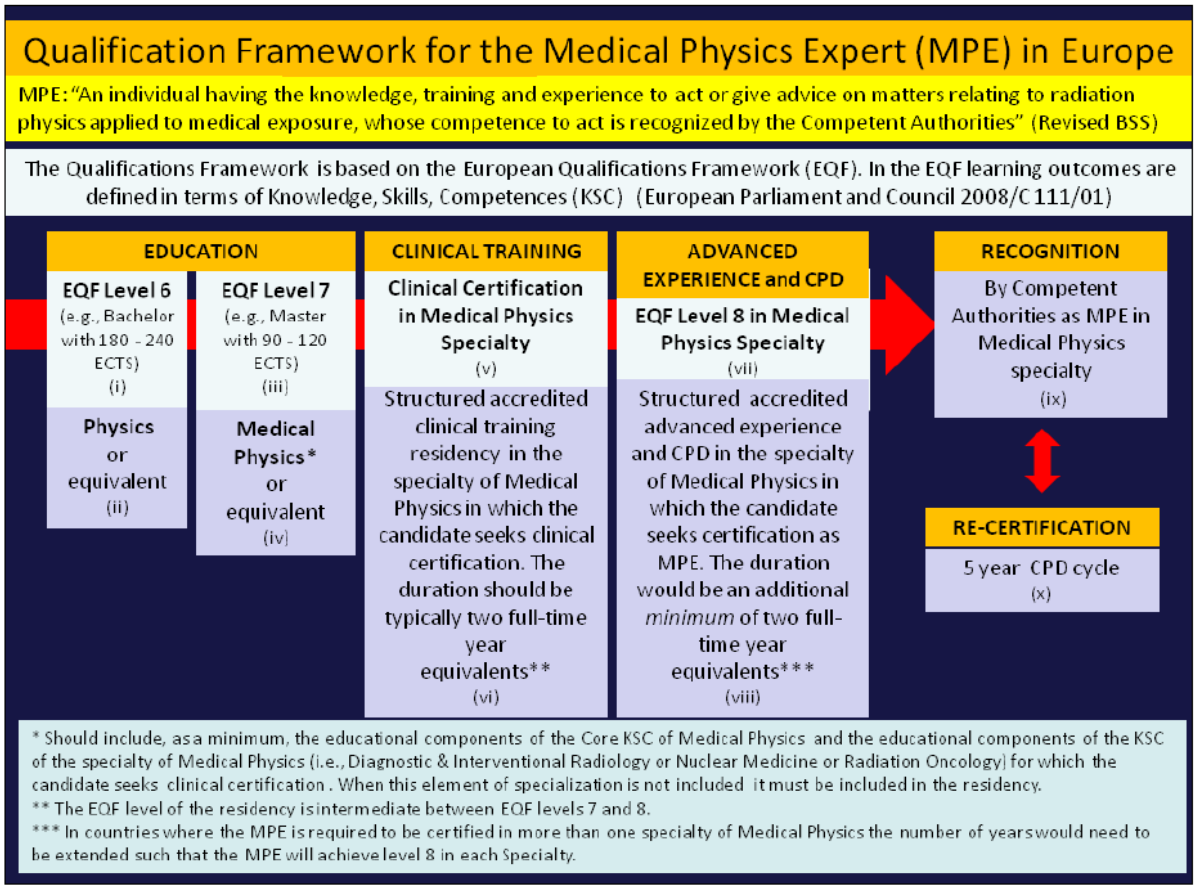
1. **General information** (organization/person holding the course/event, time, location, title of the course/event)
2. The **subject areas** accredited for the course/event (applies only to education [to qualify as medical physicists])
3. **Education points, advanced training points** or **CPD points**
4. If applicable: assessment/examination results (e.g. passed successfully)

Appendix 6: Pathways to medical physicists and medical experts



For comparison: EUROPEAN GUIDELINES ON MEDICAL PHYSICS EXPERT (Radiation Protection No 174)

Figure 1:The Qualification Framework for the MPE in Europe



Appendix 7: Certificate "Medical Physicist (ÖGMP)"“

Zertifikat

DIE ÖSTERREICHISCHE GESELLSCHAFT FÜR MEDIZINISCHE PHYSIK (ÖGMP)

erteilt hiermit

.....

die

FACHANERKENNUNG FÜR MEDIZINISCHE PHYSIK

gemäß den Richtlinien der ÖGMP in der geltenden Fassung

und die Berechtigung, die Berufsbezeichnung

Medizinphysikerin (ÖGMP)

zu führen.

Die Fachanerkennung gilt bis .....

Ausgefertigt am .....

Der Vorsitzende der Gesellschaft Der Vorsitzende der Kommission für die Fachanerkennung

Appendix 8: Certificate "Medical Physics Expert (ÖGMP)"

Zertifikat

DIE ÖSTERREICHISCHE GESELLSCHAFT FÜR MEDIZINISCHE PHYSIK (ÖGMP)

erteilt hiermit

.....

die

FACHANERKENNUNG FÜR MEDIZINISCHE PHYSIK

gemäß den Richtlinien der ÖGMP in der geltenden Fassung

und die Berechtigung, die Berufsbezeichnung

Medizinphysiker (ÖGMP)

zu führen.

Die Fachanerkennung gilt bis .....

Ausgefertigt am .....

Der Vorsitzende der Gesellschaft

Der Vorsitzende der Kommission für die Fachanerkennung

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