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Haute Ecole Spécialisée
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University of Applied Sciences
Western Switzerland

# Framework study plan
# Bachelor's degree 2006

## Degree course in
## Radiologic Medical Imaging Technology

## at the University of Applied Sciences
## Western Switzerland

This document was adopted by the Board of Directors of the HES-SO on 8 September 2006

## *Preamble*

The degree course in Radiologic Medical Imaging Technology is an integral part of the "Health" field of the HES-SO, which also includes the degree courses in Nutrition and Dietetics, Occupational Therapy, Physiotherapy, Psychomotricity, Midwifery and Nursing.

## 1. Introduction to the profession and the course

In a technical health context that is developing rapidly, the medical radiology technician combines the use of complex scientific knowledge with innovative technological performance and important social and relational qualities. These demanding personal qualifications are necessary for the exercise of a profession that involves undertaking investigations and examinations for diagnostic purposes or applying curative or palliative treatments with the help of sophisticated technological equipment. Similarly, the measurement and analysis of digital data, the use of radio isotopes in nuclear medicine, and the interpretation of both analog and digital images all require rigorous thinking and precise actions. Finally, investigations undertaken in connection with medical emergencies mean that the medical radiology technician is increasingly required to deal with situations of high and often unforeseeable complexity.

To prepare future medical radiology technicians for the exercise of this demanding profession, the training is based on a skills base drawn up and regularly updated to reflect the reality of the working environment. In addition, the educational principles used stimulate progression and continuing development. Finally, the course is designed with a generalist perspective, in the sense that it leads students to familiarise themselves with the usual three fields of activity of the medical radiology technician:

*General radiodiagnostics*, which uses numerous methods and types of investigation equipment derived from recent technologies with radiophysical foundations: X-rays (radiography and scanners), ultrasonic frequencies (ultrasound imaging), magnetism (magnetic resonance imaging). These procedures enable images of the body to be produced by transparency, in different views, in real time and dynamically.

*Nuclear medicine*, which uses radioactivity as a source for the creation of data and images. Radio-isotopes are administered to the patient in infinitesimal quantities. These examinations reveal and objectify the functioning of an organ (physiology).

*Radio-oncology*, the aim of which is to treat cancers using ionising radiation. Working together with the doctor and the radiophysician, the medical radiology technician participates in the development and implementation of the therapy plan and therefore plays an important part in patient assistance and support.

The training also places the emphasis on developing expertise within the field of radioprotection. This is aimed on the one hand at the patient, involving as it does the use and manipulation of doses that are as low as possible for obtaining the best possible results. On the other hand, this expertise also involves the healthcare team, whom the medical radiology technician provides with information, advises and trains on the types of investigations and necessary protection measures.

In recent years, three development trends in the professional practice of the medical radiology technician have been observed:

- the widespread, rapid appearance of new investigative and treatment technologies (for example, positron emission tomography);
- changes to the role and importance of the medical radiology technician in preventive medicine (for example, the implementation of breast cancer screening programmes by mammography);
- the type and frequency of interventions by medical radiology technicians requiring an interdisciplinary and/or multidisciplinary approach (for example, interdisciplinary radio-oncology group).

These trends have been given particular attention in the Radiologic Medical Imaging Technology course programme as it appears that they are increasingly frequent, characterising and structuring the exercise of the profession of medical radiology technician both now and in the near future.

## 2. Concept of the degree course

The framework study plan for the Bachelor's degree course in Radiologic Medical Imaging Technology provides practically-oriented, generalist training, which stimulates the development of the professional skills necessary to exercise the profession. Its implementation is therefore based on the complementary and convergent elements represented by:

- Highlighting the tasks, the functions and the responsibilities of the professional – for example using the skills base of the Swiss association of medical radiology technicians (ASTRM) to consolidate the course skills base.

- The identification and selection of the essential educational foundations, articulations and determinants – for example by referring to typical professional situations which, in their totality, give a condensed representation of professional reality and a concentrated range of the knowledge and skills which will need to be developed during the course.

- Respect of the taxonomic levels imposed by a Bachelor's degree course – for example, by referring methodically to the Best Practices and recommendations of the Rectors' Conference of the Swiss Universities of Applied Sciences (KFH) and the "Dublin Descriptors" in the operational design of the programmes.

- The systematic integration of developments arising in the structure of the HES-SO field of Health – for example, consideration of the skills base proposed by the HES-SO to the specialist health conference of the Rectors' Conference of the Swiss Universities of Applied Sciences (KFH), which allows for the identification of skills shared by the different health professions.

It is this professional, educational and organisational framework that guarantees the internal and external coherence of the framework study plan as well as its global relevance. The principal concepts are further developed below.

## 2.1. Skills base

The skills base for the course is made up of a collection of contextualised skills:

- Each generic skill is expressed by a qualified, finalised description of the action/activity.

- Each generic skill is contextualised by the present participle clauses which demonstrate how the activity is carried out and specify a global taxonomic level.

Generic skill 1

➡ Undertake various radiological investigations, examinations and clinical procedures with a diagnostic purpose

- Keeping to the various protocols autonomously and/or in partnership;
- Promoting patient participation by adapting the information and support given in line with the patient's physical and psychological condition and with the constraints of the examination;
- Determining and adapting the specific technical methods to the principles and conditions of implementation of the investigation within the scope of the technology used;
- Administering appropriately the pharmaceutical products and contrast agents currently used in medical radiology;
- Orienting the investigation procedure and processing of the results for qualitative optimisation.

Generic skill 2

➡ Determine and draw up treatment and implementation plans, then undertake the various therapeutic activities within the field of medical radiology

- Assuring execution in full of the treatment plans and therapeutic activities, autonomously, as part of a team or in partnership;
- Adopting intervention and support strategies which take account of the aims and characteristics of procedures prescribed for palliative or curative ends;
- Administering pharmaceutical products appropriately, taking account of the uniqueness of every situation;
- Systematically researching the best conditions for the physical, technical and functional implementation of the therapeutic activities with a qualitative aim, including efficiency, safety, comfort and economy.

Generic skill 3

➡ Take account of and assess all the technical and physical data to assure a precise, reliable interpretation of the radiological images

- Systematically analysing the fundamentals of how the analog/digital image is formed;
- Referring to the quality (contrast, resolution, dose, etc.) and conformity criteria of the radiological images;

- Considering the possible impact of the physical condition of the patient on the course of the investigation and/or the results of the image;
- Making technically-based choices in connection with the protocol and/or the parameters of the investigation;
- Analysing the results based on the technology used and the clinical data of the beneficiaries;
- Identifying any anatamo-physio-pathological anomalies and adding to or correcting the record of these and/or the investigation parameters.

Generic skill 4

➡ Take on the role of expert in radioprotection within the scope of medical radiology

- Regularly appraising the risks presented by situations that require recourse to ionising rays;
- Applying all protective measures for patients faced with ionising rays;
- Complying with the ALARA rule, that is: As Low As Reasonably Achievable;
- Taking account of the structural and environmental aspects of the location in which the investigations or treatments take place;
- Informing the various partners of the risks and effects of the ionising radiation connected with the radiological investigations and treatments;
- Training the various healthcare professionals in the proper use of medical radiology and the associated risks;
- Putting into operation and monitoring a Quality programme in accordance with the Swiss federal radioprotection order of 28 June 1994 issued by the Swiss Federal Office of Public Health.

Generic skill 5

➡ Establish a relationship, communicate and work together effectively with patients, the team and all other partners

- Creating the conditions for a relationship of trust with patients and their carers, by personalised means of information, assistance, involvement and support;
- Involving themselves in team work, in cooperative, decision-making and/or modification processes, as well as in the development of joint projects;
- Contributing to the supervision and training of trainees and students within the scope of the facilities provided;
- Participating in the integration of new employees;
- Respecting the ethical aspects defined by the profession;
- Promoting the implementation of methods and resources enabling communication and the transfer of information about the patient;
- Cooperating in the implementation of networked projects.

Generic skill 6

➡ Establish their position as a member of the healthcare system and a responsible professional

- Maintaining a critical view of their professional practice;
- Evaluating what they do using the appropriate instruments and methods;
- Updating their knowledge and professional practices by various means (continuing education, interdisciplinary collaboration, networked projects, etc.) and using the results of their research;
- Developing a reflexive position and scientific culture by the use of research methods;
- Participating in professional and/or interdisciplinary research projects;
- Participating in the production of knowledge in a way that will contribute to the development of the profession of medical radiology technician.

The development of these skills at Bachelor level clearly depends on the knowledge and capacities acquired by students during their previous education and training, and/or during their preparatory year. During the course several stages enable milestones to be set and a progression and incremental increase in complexity to be determined.

## 2.2. Educational and teaching principles

The educational options retained within the implementation of the programme provide for the support of students as they develop their autonomy, their sense of responsibility and their use of effective, positive methods of thought, work and involvement, following the logic of the education of adults and reflexive practitioners. The following headings demonstrate the concretisation of these intentions within the course:

- Adult education: this characteristic is evident in the new role assumed by students on the course. They are progressively led to make choices, take decisions, draw up their own training and professional projects – for example, the choice of placements and optional modules, the negotiation of certain objectives within the tripartite contract, the undertaking of participative courses requiring significant personal involvement, etc.

- Reflexive practitioner: in this case, the term refers to professionals who have the capacity to use the actual situations they encounter to learn, progress, deal with the unforeseen and propose new interventions. To develop this approach, students are systematically stimulated in their analysis of their practice during the preparation and implementation phases of their practical training periods, and are trained to undertake self-assessment and metacognition, etc.

- Alternating training: it is during the periods of practical training in a real professional context that students encounter the activities and responsibilities of a medical radiology technician. The training practitioner (a professional in the field) supervises the students and ensures that the right conditions for learning are in place. These training periods are systematically prepared for and implemented. Other activities also based in the field – observation visits, meetings with experts, exploratory visits, etc. – also contribute to the integrative dimension of alternation.

- A many-sided didactic approach: the variety of skills to be acquired requires the use of diverse teaching methods, adapted to suit the type of learning to be achieved. Students thus benefit during the course from: seminars, lectures and conferences, documentary research, guided work (workshops, structured debates, various simulations), practical work in the field or using simulators, the development and implementation of a project, research work, practical placements and training.

- Training in research: this progressive initiation is aimed at professional practice and is designed to lead to the consideration of issues encountered by the student in practice. It is a matter of putting in place a process for mediation between the practitioner and practice, producing an intelligibility that is interpretative in nature. This training seeks to develop critical faculties, an increase in awareness and the ability to react creatively when faced with professional situations that are never totally rational or reasonable.

## 2.3. Course axes

Multidisciplinary subject groups (the intersection between disciplines, knowledge and practical experience) are arranged along axes which enable the course to be organised in line with the development of professional skills. These axes clarify the main components of coordinated training in the field of health, and may facilitate the development of shared modules or correspond to areas of research.

With the aim of enabling them to fulfil their organisational role behind the course "without having a prescriptive role", the degree course presents these axes under four headings under which the teaching modules are grouped. These are:

- Axis 1, "Professional intervention" (professional intervention): Covers the conceptual references and frameworks, clinical reasoning and the methodologies specific to the profession ("Physics of the processes applied in medical radiology", "Positioning and movements", "Study of images", etc.).

- Axis II, "Social and health structures and functions" (professions, institutions and organisations/individuals, culture and societies/social and health problems, institutional responses): Covers teaching connected with the main social and political problems and issues of the various groups and institutions to which professionals will belong. The teaching connected with this axis refers mainly to persons involved within structures relating to social and health functions ("Health policies", "Organisational models", "Cultural approaches", etc.).

- Axis III, "Scientific foundations and technological applications" (health sciences, technologies and their scientific foundations): Covers the study of the determining factors of health connected with ideas of balance and imbalance, and encompasses the various technologies and main scientific foundations useful to the health professions ("Biomedical disciplines of health", "Radiophysics", "The equipment chain", etc.)

- Axis IV, "Learning processes and professional project": Covers teaching and learning systems relating to the actual training and professionalisation process. This axis enables students and future professionals to develop a reflexive relationship with their training and the transformations it triggers.

These 4 axes are present throughout the course.

## 2.4. Alternation - practical training

Alternation between classroom-based learning and training in practical and working environments is central to the Radiologic Medical Imaging Technology course. The aim of the practical training is to enable students to build up their professional skills; in other words, it places students in a "professionalising" situation to enable them to develop the professional, relational and social skills required for professional practice.

The integrative dimension is brought about by implementing a system which provides for the use, synthesis and integration of the knowledge gained in the different places of learning. The system also favours controlled implementation and experimentation, the analysis of practices and a progressive build-up of professionalism. It promotes drawing on experience and dynamic approaches that incite thought and involvement.

The duration of the practical training represents 50% of the overall course, that is 48 weeks of attendance in the professional environment. It corresponds to 90 ECTS credits. Each semester of training includes a module organised around a period of practical training. Within the perspective of a generalist course, the 6 periods of practical training are organised in accordance with the following schedule:

| | |
|---|---|
| First semester | Period of practical training providing for initiation and familiarisation with the basic elements of practice, undertaken in a general radiology environment |
| Second semester, third semester, fourth semester | The three subsequent periods are devoted to the discovery, acquisition and exercise of the constituent skills in the three "classic" areas of activity of a medical radiology technician: general radiodiagnostics, nuclear medicine and radiotherapy |
| Fifth semester, sixth semester | The last two periods are undertaken with a perspective of extending knowledge and skills and effective professionalisation within the scope of a personal and professional project. |

The educational logic of these modules contributes to building up knowledge derived from practical experience and promotes reasoned integration of what has been learned. These modules systematically begin with targeted preparation of students and include monitoring and consolidation of what they have learned using different methods (seminars, analyses of practice, case studies, etc.)

A tripartite educational contract is drawn up for each module/period of practical training. Actively involved in their own education, students participate in drawing up their learning objectives. This naturally takes account of the knowledge already integrated and that relating to the placement for the period in question, the taxonomic level, any experience already gained during their education and training to date, and the specific requirements of the placement where they will receive their practical training. In order to do this, students have a day of "immersion". During this day students can find out about the daily activities carried out in the department and adapt their objectives in line with the possibilities offered by the placement.

The professionals, the training practitioners and the teaching staff will act in the capacity of "resource persons" to plan the experiences which will enable students to acquire knowledge and develop their skills; they will support students in their gestural, relational, technical, organisational and reflexive learning, taking count of the individuality of each situation.

## 2.5. Bachelor's thesis

The Bachelor's thesis involves developing a theoretical issue derived from a professional problem, identified as part of the student's personal professionalisation project, which may be undertaken individually or as part of a group.

It enables the student, or group of students, to demonstrate their capacity for:

- Analysing a professional situation;
- Applying theory to practice;
- Constructing formalised knowledge – communicable and verifiable.

The Bachelor's thesis is an opportunity for students to bring together the intention to prove validity (scientific approach), the regard for justice (consideration of values) and the desire for efficiency and effectiveness (operationalisation of actions) required of professionals whose interventions are carried out at the expert level of a UAS graduate.

The course system as implemented for the completion of the Bachelor's thesis combines and sets out 3 distinct educational cultures:

- A culture of teaching by passing on theoretical and methodological knowledge where the student is the object of the training.

- A culture of education oriented towards learning skills (thought, analysis, synthesis) where the student is the subject of the training.

- A culture of professionalisation aimed at developing skills where the student is a social agent (UAS medical radiology technician) of the future.

The Bachelor's thesis, involving the written work and oral examination, accounts for 15 ECTS credits.

## 3. Structure of the studies

The course is therefore organised in modules arranged by semesters which are based on taxonomic levels useful in the evaluation of the development of skills.

| | |
|---|---|
| First semester | Initiation |
| Second semester<br>Third semester<br>Fourth semester | Supervised activity |
| Fifth semester, sixth semester | Professionalisation by "autonomous activity" |

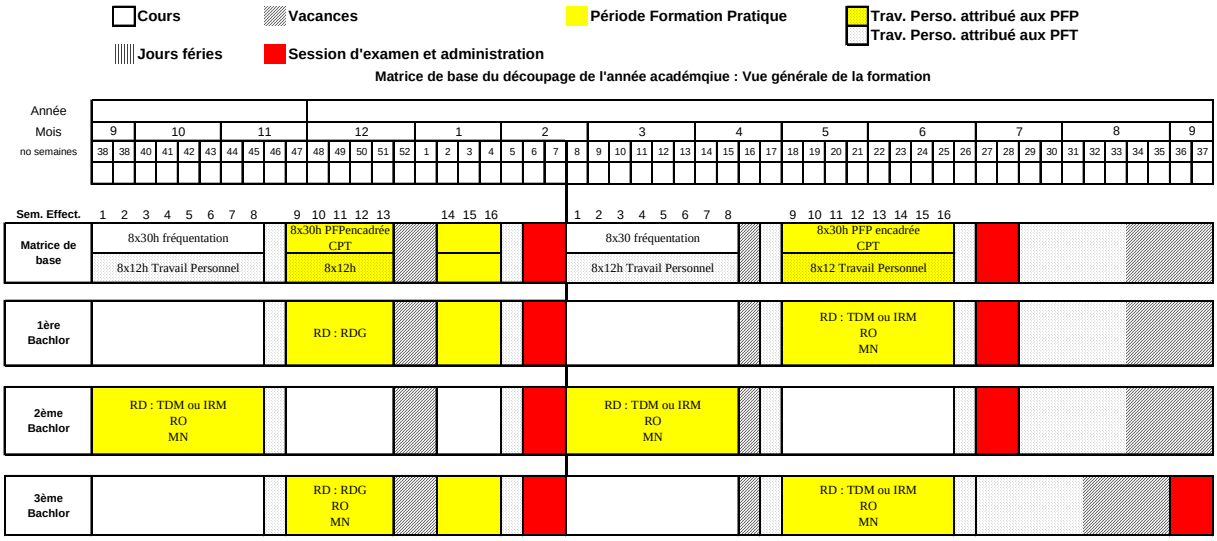
## 3.1. Academic calendar

The academic year is made up of two semesters:

- The first semester is from Week 38 to Week 7 (winter)
- The second semester is from Week 8 to Week 37 (summer)

The academic year comprises:

- Semesters alternating between lessons and/or instruction in the classroom and practical training modules
- Periods of personal work
- 7 weeks' holiday (2 weeks at Christmas, 1 week at Easter, 4 weeks in summer)




*See separate file*

## 3.2. Modular organisation

Each module is primarily associated with an axis.

All its features are shown on a module sheet, with standard headings: title, credits, breakdown by hours and calendar, general aims of the module, skills to be acquired, content, educational methods and demands, evaluation methods, module head and teaching staff, etc.

Modules may be presented in two forms: en bloc or intermittent.

- All modules are Type C - Core course: a module corresponding to basic professional skills.
- The modules of the first semester are level B - Basic level course: modules for the acquisition of the basic concepts of the profession.
- The modules of the second to the sixth semester are level I - Intermediate level course: modules extending the basic concepts of the profession.

## 4. Mobility/internationalisation

Inter-campus mobility within the course is compulsory for the Bachelor's degree course in Radiologic Medical Imaging Technology for certain teaching or training modules during the three years – corresponding to around a quarter of the theoretical part of the course. In the cases in question, the two groups of students come together for the same teaching sessions or benefit from the same infrastructures.

With regard to mobility in the form of international exchanges, the geographical proximity of the Geneva campus to France means it is in an ideal position to offer a placement abroad to all its students. It should be noted that the aim of these practical training periods abroad is not primarily the technological dimension, but rather gaining knowledge of other countries' healthcare systems, ways of organising work, professional roles, etc. The quality of technical equipment in Swiss hospitals is second in the world, which makes practical experience placements in the area around Lake Geneva more attractive with regard to this aspect. For this same reason the course takes in two or three foreign students a year.

In general, students and teaching staff can have recourse to existing structures within the HES-SO. Among these structures the following are particularly noteworthy:

- the international relations fund, established to finance exchanges of teaching staff and students;
- the international exchange programmes ERASMUS and LEONARDO, managed by the Valais office on behalf of the HES-SO.

Each campus in the course may approach the international exchange bureau, an internal structure to facilitate student mobility. From the end of the first semester the framework study plan offers students the option of undertaking periods of practical training abroad on the basis of a personal professionalisation project negotiated and validated by the course staff.

## 5. Quality

The Bachelor's degree course in Radiologic Medical Imaging Technology is integrated into the HES-SO quality system. The modules are the subject of periodic evaluations using questionnaires completed by students and teaching staff. The results are forwarded to the designated person or department at each campus. This procedure enables the course provision to be adjusted as required. Partnership with professional environments is one of the means by which the suitability of the study plan for the requirements of practice is assessed.