

Operational information on the

PhD Program

Image-guided diagnosis and therapy (IGDT)

Program coordinators:

Univ. Prof *h.c.* Mag. Dr. C. Decristoforo

Univ. Hospital for Nuclear Medicine,

and

o. Univ. Prof. Dr. W. Jaschke,

Univ. Clinic of Radiology

Innsbruck Medical University, Austria

1 Motivation:

Digital imaging has had a huge impact in medicine, and the current state-of-the-art imaging is rapidly changing the contemporary practice of medicine. More and more, medical treatment exploits the wide variety of medical imaging that hospitals, as the Innsbruck Medical University (MUI), have at their disposal.

The strong impact of imaging technology has to be met by a Medical University. This demand is reflected in the number of medical students enrolling in specialization programs to obtain a

PhD. Since medical research is largely - and it seems increasingly – interdisciplinary today, this PhD program is open to graduates with a broad range of specialities.

The specific aims of the IGDT PhD program are as follows:

- To provide **graduates of a medical faculty / university / school** with extended experience in scientific working methodology as a sound base for future academic career.
- To allow **graduates medicine** reaching specialization and sound scientific experience in state-of-the art image-based diagnosis and therapy.
- To provide an opportunity **for graduates in natural sciences and technical studies** specializing in an applied field, reaching a complementary post-tertiary academic education in the interdisciplinary medical environment as represented by IGDT.
- To provide the human resources for strengthening the industrial developments in biomedical engineering and medical technology, especially with focus to the province of Tyrol.
- To further implement the unification of academic degrees at the Innsbruck Medical University according to the Bologna Convention.
- The IGDT PhD program will strengthen the international position of the Innsbruck Medical University in the field of digital applications in diagnosis, therapy and image-guidance.

Summary:

The PhD program “Image-guided diagnosis and therapy” (IGDT) links clinical state-of-the-art research with post-graduate interdisciplinary education by fostering an interdisciplinary, inter-faculty and inter-university approach.

2. Aim

The interdisciplinary PhD program “Image-Guided Diagnosis and Therapy” provides its participating academic institutions means to expanding image-based diagnostic and therapeutic medicine in the lab and the clinics; this PhD program is set out to actively shape future developments in image- based medicine.

3. Participating Institutions:

Presently the following institutions and personalities are participating in the program:

Department of Anatomy, Histology and Embryology	Prof. Fritsch	MUI
Department of Medical Statistics, Computer Sciences, and Health Management	Prof. Ulmer	MUI
Department of Physiology and Medical Physics	Prof. Ritsch-Marte	MUI
Department of Nuclear Medicine	Prof. Virgolini	MUI
	Prof. Decristoforo	MUI
Department of Otorhinolaryngology	Prof. Riechelmann	MUI
Department for Diagnostic Radiology	Prof. Jaschke	MUI
Department of Radiotherapy	Prof. Ganswindt	MUI
Institute of Biomedical Engineering	Prof. Baumgarten	UMIT*
Institute for Biomedical Image Analysis	Prof. Schubert	UMIT*

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UMIT: University for Health Sciences, Medical Informatics and Technology Tyrol / Private Universität für Gesundheitswissenschaften, Medizinische Informatik und Technik Tirol (www.umat.at).

4. Structure

After successfully completing the IGDT program a common base of knowledge, irrespective of the individual primary academic education will be created allowing a successful continuation of research in academia and in industry.

4.1 PhD thesis work

During the six semesters, the candidates will have to work under the guidance of an experienced scholar. The thesis should demonstrate the candidate's ability to work independently on a complex scientific problem. The writeup of the thesis' research results has to be presented in written form, in paper and in an electronic version. At least one international peer-reviewed paper (at least with the status of "accepted paper") is necessary to apply for the review of the thesis.

During the PhD study it is highly encouraged that the candidates participate in international student's exchange programs within the framework of the EU to raise international experience, acquisition of knowledge, expertise and networking with international research groups.

4.2 Accompanying education

The study plan requires 30 hours to be taken in the course of the six semesters of the IGDT program which the candidates may chose to achieve a maximum of knowledge in the field. In general, students with an MD have to select topics focused on subjects of natural sciences (i.e. mathematics, physics, computer science) at an adequate level; students with a degree in the Sciences have to acquire sufficient knowledge of anatomy, physiology, pathology and surgical techniques at an adequate level.

4.3 Additional

The IGDT PhD program is open to future qualifying supervisors and teachers willing to participate.

5 Study Plan

The numbers given show the minimum and maximum number of hours to be chosen in accordance with the study plan for the PhD doctoral study at the Innsbruck Medical University. A course-hour lasts 45 minutes, and is being given 15 times per semester. Typically, the lectures are being held block-wise, e.g. three days à four hours or equivalently. Exceptions from this study plan have to be approved by the program coordinators.

Introductory courses: ("Kernfächer 1")

Basic courses

Clinical applications

Advanced courses: ("Kernfächer 2")

Specializations

Subtotal to be achieved (8, 14)*

General courses: ("Allgemeine Fächer") (4, 8)

Oral presentations (seminars, lectures) (6, 8)

Research seminars (6,6)

Total 30

In the last two semesters of the IGDT program only the literature / scientific and research training seminars, respectively, are to be attended.

The following is a detailed synopsis of the curriculum which shows the courses and the durations.

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The courses should be chosen such that the thesis work is ideally supported and that the student's state of knowledge is maximally complemented.

5.1 Introductory courses		Type	ECTS
5.1.1 Basics courses:			
<u>Anatomy:</u>	Anatomy	VU	2
	Cross-sectional anatomy and radio-anatomy	VU	2
<u>Mathematics:</u>	Applied statistics and bio-statistics	VU	3
	Image reconstruction	VO	2
	Image reconstruction for MDs	VO	1
	Bio-mathematics for MDs	VU	2
<u>Physics:</u>	Accelerator physics	VO	1
	Imaging Physics I & II	VO	3
	Imaging Physics for MDs	VO	1
	Nuclear physics	VO	1
<u>Radiology:</u>	Laser and MR-imaging safety	VO	1
	Quality management and dosimetry in imaging	VO	2
5.1.2 Clinical applications:			
	Computer-assisted planning and simulation in Radiotherapy	VU	1
	Image-guided procedures in clinical practice	UE	1
	Image-guided procedures I & II & III, each	VU	1
	Invasive radiology	VO	1
	Nuclear medical diagnostics	VO	2
	Radiology and radio-protection	VO	1.5
	Radiotherapy with open radio-nuclides for non-MDs	VO	1
	Ultrasound diagnostics	VU	1
	X-ray image analysis and interpretation	VO	1
5.2 Advanced courses			
5.2.1 Specializations:			
	Biomedical signal processing	VU	2
	Functional imaging	VO	1
	Image processing - basic	VO	1
	Image processing - advanced	VU	2

	Knowledge representation and visualization	VO	1
	Optical methods in medicine	VO	1
	Molecular imaging, radio-chemistry	VO	1
	Operating systems and C/C++	VU	2
5.2.2	<u>Supplementary courses:</u>		
	Hygiene	SE	1
	General Subject for all PhD Programs.		
5.3	Oral presentations (seminars, lectures) [bi-weekly, alternating]		
	Scientific seminar	SE	1
	Literature seminar	SE	1
5.4	Research (group) seminars		
	Research training seminar	SE	1

Legend: VO(x), lectures; in all following types attendance is required :VU(x) lecture with exercise, UE(x) exercises, SE(x) seminar, and PR(x) practical working; x indicates the ECTS.

6 Additional

Financing: It is strongly recommended to finance the individual doctoral theses by Third-Party-Funding in order to realize a continuous work of the candidate, as is common practice in the Natural Sciences. However, the coordinators are aware of the specific situation within a clinical environment, in which the IGDT is immersed. It is stated explicitly here that it is possible to work within the IGDT program without financial compensation, but this is strongly discouraged.

Residency and IGDT: It will be possible for clinicians to work on a part-time level (not less than 50 %) on a PhD thesis and on a residency training simultaneously. The durations of the PhD study and the residency will change indirectly proportionally. Financial compensation has to be regulated by the clinic / institution hosting the joint IGDT & residential candidate.

Written official evidence concerning the actual percentage of working-hours permitted for the PhD study has to be given to the coordinators.

Occupational integration: In cases where no financial compensation (employment) is provided by the faculty, the arrangements concerning the practical implementation of the thesis work shall be taken on an individual basis between the student and the supervisor. § 13 (2) lit f UG 2002 has to be followed in compliance with the PhD Curriculum, however.

7 Regulatory affairs

Most of the potentially arising issues with respect to teaching, courses and so forth that can be foreseen at the present date will be solved by the coordinators and, if deemed necessary, the additional third member on an informal and efficient basis. Issues arising between faculty and student (supervision, work, GSP, etc.) shall be dealt with by the Thesis Advisory Committee (TAC), the Coordinators and lastly by the Vice-rector of Teaching and Study affairs.

	Semester 1		Semester 2		Semester 3		Semester 4
Introductory Basic	Anatomy (VU 2)	Introductory Basic	Cross-sectional and radio-anatomy (VU 2)	Adv. Specialization	Functional imaging (VO 1)	Adv. Specialization	Molecular imaging and radio-chemistry (VO 1)
	Applied statistics and bio-statistics (VU 3)		Imaging physics for MDs (VO 2)		Image processing - basic (VO 1)		Image processing - advanced (VU 2)
	Image reconstruction (VO 2)		Image reconstruction for MDs (VO 1)		Knowledge representation and visualization (VO 1)		Biomedical signal processing (VU 2)
	Imaging physics I (VO 1.5)		Imaging physics II (VO 1.5)		Optical methods in medicine (VO 1)		
	Bio-mathematics for MDs (VU 2)		Accelerator physics (VO 1)				
	Laser and MR-imaging safety (VO 1)		Nuclear physics (VO 1)		Image-guided procedures III (VU 1)		
	Quality management and dosimetry of imaging (VO 2)				Organization of clinical studies (VU 1)		
							General Subjects
Introductory Clinical	Image-guided procedures I (VU 1)	Introductory Clinical	Image-guided procedures II (VU 1)	Adv. Supplementary		Adv. Supplementary	
	Computer-assisted planning and simulation in radiotherapy (VU 1)		Nuclear medical diagnostics (VO 2)				
	Radiotherapy with open radio-nuclides for non-MDs. (VO 1)		Radiology and radio-protection (VO 1.5)		Hygiene (SE 1)		
	Image-guided procedures in clinical practice (UE 1)		X-ray image analysis and interpretation (VO 1)		General Subjects		
Seminars	Literature seminar (SE 1)	Seminars	Literature seminar (SE 1)	Seminars	Literature seminar (SE 1)	Seminars	Literature seminar (SE 1)
	Scientific seminar (SE 1)		Scientific seminar (SE 1)		Scientific seminar (SE 1)		Scientific seminar (SE 1)
	Research training seminar (SE 1)		Research training seminar (SE 1)		Research training seminar (SE 1)		Research training seminar (SE 1)

* for semesters 5 and 6 only seminars are foreseen.

Study Plan - Individual Course Planning: Starting Point: Graduation in Natural Sciences for semester 1 - 4* (exemplary selection in boldface)

	Semester 1		Semester 2		Semester 3		Semester 4
Introductory Basic	Anatomy (VU 2)	Introductory Basic	Cross-sectional and radio-anatomy (VO 2)	Adv. Specialization	Functional imaging (VO 1)	Adv. Specialization	Molecular imaging and radio-chemistry (VO 1)
	Applied statistics and bio-statistics (VU 3)		Imaging physics for MDs (VO 2)		Image processing - basic (VO 1)		Image processing - advanced (VU 2)
	Image reconstruction (VO 2)		Image reconstruction for MDs (VO 1)		Knowledge representation and visualization (VO 1)		Biomedical signal processing (VU 2)
	Imaging physics I (VO 1.5)		Imaging physics II (VO 1.5)		Optical methods in medicine (VO 1)		
	Bio-mathematics for MDs (VU 2)		Accelerator physics (VO 1)				
	Laser and MR-imaging safety (VO 1)		Nuclear physics (VO 1)		Image-guided procedures III (VU 1)		
	Quality management and dosimetry of imaging (VO 2)				Organization of clinical studies (VU 1)		
		Operating systems, C/C++ (VU 2)					
Introductory Clinical	Image-guided procedures I (VU 1)	Introductory Clinical	Image-guided procedures II (VU 1)	Adv. Supplementary		Adv. Supplementary	General Subjects
	Computer-assisted planning and simulation in radiotherapy (VU 1)		Nuclear medical diagnostics (VO 2)				
	Radiotherapy with open radio-nuclides for non-MDs. (VO 1)		Radiology and radio-protection (VO 1.5)		Hygiene (SE 1)		
	Image-guided procedures in clinical practice (UE 1)		X-ray image analysis and interpretation (VO 1)		General Subjects		
Seminars	Literature seminar (SE 1)	Seminars	Invasive radiology (VO 1)	Seminars		Seminars	Literature seminar (SE 1)
	Scientific seminar (SE 1)		Ultrasound diagnostics (VU 1)				Scientific seminar (SE 1)
	Research training seminar (SE 1)		Literature seminar (SE 1)				Research training seminar (SE 1)
			Scientific seminar (SE 1)				Research training seminar (SE 1)
			Research training seminar (SE 1)				

* for semesters 5 and 6 only seminars are foreseen.