

# Curriculum for the Professional Bachelor Programme in Biomedical Laboratory Analysis

This curriculum has been drawn up pursuant to ministerial order no. 652 of 29 June 2009 concerning the Professional Bachelor Programme in Biomedical Laboratory Analysis and forms part of the overall rules governing the programme.

In the event of any discrepancy between the curriculum and the general rules for the programme, the general rule will apply.

The curriculum was approved by the Ministry of Education, 23 July 2009, cf. ref. no. 159.924.021.

The objectives of the curriculum are:

- to take into account developments in the healthcare and educational fields – specifically, to incorporate thinking about the future of biomedical laboratory analysis, as well as biomedical laboratory technologists' qualifications - knowledge, skills and competences
- to assure the quality of the programme by means of consistent and uniform application of the requirements and expectations contained in the ministerial order
- to create frameworks for inter-institutional knowledge-sharing and the enhancement of the Professional Bachelor Programme in Biomedical Laboratory Analysis.

# Table of Contents

1	Objectives.....	5
2	Programme profile.....	6
	2.1 The work of the biomedical laboratory technologist.....	6
	2.2 Knowledge base and methodology.....	6
	2.3 The academic basis for the programme.....	7
3	Structure and organisation of the programme.....	8
	3.1 ECTS credits – European Credit Transfer System.....	9
	3.2 Subjects and where they fit into in the programme.....	10
4	Modules .....	11
	4.1 Module 1 – Practical Bioanalysis.....	11
	4.2 Module 2 – Basic human biology and bioanalysis.....	13
	4.3 Module 3 – Basic biochemistry and bioanalysis.....	15
	4.4 Module 4 – Bioanalytical quality assurance .....	17
	4.5 Module 5 – Interdisciplinary teamwork .....	19
	4.6 Module 6 – Advanced human biology and bioanalysis .....	21
	4.7 Module 7 – Advanced biochemistry and bioanalysis .....	23
	4.8 Module 8 – Molecular-biology and genetic analyses .....	25
	4.9 Module 9 – Biomedical laboratory analysis in an interdisciplinary perspective .....	27
	4.10 Module 10 – Immunochemical analyses.....	29
	4.11 Module 11 – Clinical module.....	31
	4.12 Module 12 – Bioanalytical development and quality assurance .....	34
	4.13 Module 13 – Elective Module: Knowledge of bioanalytical practice, development and research.....	36
	4.14 Module 14 – Professional Bachelor Project.....	38
5	Types of classes and ways of working .....	40
	5.1 Theory classes .....	40
	5.2 Clinical training.....	40
	5.3 Information technology (IT) .....	41
	5.4 Academic supervision .....	41
	5.5 Student guidance .....	42
6	Co-operation between the educational institution and clinical training sites ...	42
7	Criteria for approval of clinical training sites.....	43
8	Study plans .....	44
9	International educational opportunities .....	45

10	Tests and assessments.....	45
10.1	List of assessments during the programme .....	45
10.2	Guidelines for assessments .....	46
10.3	Special test conditions.....	47
11	Compulsory participation .....	47
12	Credit(s).....	47
13	Exemption.....	47

# 1 Objectives

The objective of the Professional Bachelor Programme in Biomedical Laboratory Analysis is to qualify graduates to work independently as biomedical laboratory technologists and to play their part in professional and interdisciplinary teams.

In line with social, scientific and technological trends, as well as society's needs for biomedical analyses, graduates of the programme also possess wide-ranging knowledge of the whole field of bioanalysis.

On successful completion of the programme, students will be capable of:

- understanding theory and methodology in relation to professional, ethical, working-environment and organisational conditions, and combining this with bioanalytical skills in relation to the planning, development, conducting, documentation, quality assurance and quality control of biomedical analyses
- communicating the profession's technical and practical problems and solutions
- evaluating theoretical and practical problems, including in relation to the implementation of technologies and methodologies, and justifying the actions and solutions chosen
- working with patients, relatives, colleagues and other professionals in a manner that is respectful of the individual's ethnic, cultural, religious and linguistic background
- enhancing their own knowledge, competences and skills in relation to biomedicine; innovating and applying existing knowledge in new contexts; and observing, applying and participating in research and development in the field of biomedicine
- continuing theoretical and clinical higher education.

Graduates are entitled to use the title Professional Bachelor of Biomedical Laboratory Analysis. Graduates are authorised pursuant to the Act on Authorisation of Healthcare Professionals and of Professional Healthcare Activity.

Graduates are qualified to work as biomedical laboratory technologists independently, with precision and with an awareness of quality, as well as to continue their higher education at Master's level.

## **2 Programme profile**

The Biomedical Laboratory Analysis Programme is profession- and development-based.

Profession-based means that the programme has a professional focus, i.e. it is oriented towards practice in the profession, as well as current developments and changes within the analysis and laboratory-technology area in general, and the health service in particular.

Development-based entails a focus on experimental, developmental and research work that illustrates current developments and the need for them within the analysis and laboratory-technology area in general, and in the health service in particular.

The programme is grounded in knowledge of relevant areas of research and development. The programme conveys and develops knowledge about the profession's values, theories, methods and conditions. The programme's academic standards are based upon well-documented practice and on experimental, developmental and research work that reflects current trends both in the analysis and laboratory technical area and in the function and priorities of the health service. This is ensured by keeping the programme profession- and development-based, and working with employers, research institutions and other stakeholders.

National and international research is incorporated into the programme and helps to qualify professional bioanalysis in practice. The programme develops and conveys science-theoretical understanding and research-methodology insights at Bachelor level.

The programme is organised in such a way that professional, academic and innovative qualifications are developed through dynamic interplay between theory and practice.

### **2.1 The work of the biomedical laboratory technologist**

As per the programme objectives, biomedical laboratory technologists analyse biological material to prevent, examine and treat human diseases.

They possess the knowledge, skills and competences to handle biological materials in a professional manner; to evaluate and develop methodologies and quality; and, in particular, to analyse, detect, critically evaluate and disseminate the results (including deviations).

They also possess the social and cultural knowledge, skills and competences to solve complex problems and to operate in organisations in a constant state of change.

They are capable of communicating about, managing and developing their profession both independently and as team members.

They also adopt active positions on, and relate in a critical fashion to, new technologies and new methods of treatment, and contribute to efficient, patient-based working procedures.

The work of the biomedical laboratory technologist involves people of all age groups throughout the health service.

### **2.2 Knowledge base and methodology**

Knowledge prerequisites for biomedical laboratory technologists include the science and health basis around which the subject revolves, i.e. concepts, theories, methodologies, systematic thinking, problem-solving and quality assurance.

Other prerequisites include research- and development-based knowledge relating to bioanalysis, e.g. on the development of methodologies and models for clinical evaluation, intervention and documentation, including the implementation of national and international quality-enhancement and -assurance programmes. Other prerequisites include systematised reasoning with regard to ethical

issues, recommendations, actions, and knowledge of and compliance with legal and administrative acts, ministerial orders, guidelines, etc.

## **2.3 The academic basis for the programme**

The academic basis for the programme rests on theoretical and clinical knowledge from the biomedical and laboratory-technology knowledge and experience area, in interaction with knowledge of the health-, natural- and social-sciences and the humanities.

The theory classes and clinical training aim to promote and support the students' development of knowledge, skills and competences until they acquire the learning objectives expected of a graduate biomedical laboratory technologist.

The programme consists of the following courses:

### **Biomedical Laboratory Analysis**

**125 ECTS credits**

Biomedical Laboratory Analysis equips students with the competences to conduct independent, responsible and well-reasoned analyses based on a biomedical knowledge base and associated concepts, theories and methods that help to describe, analyse and evaluate the problems, phenomena and contexts graduates will encounter in their professional lives. Graduates must be able to work independently and responsibly within the areas covered by bioanalysis, including carrying out development work and participating in research.

This subject area helps students to develop the qualifications to describe, develop and evaluate methods of analysis in the field of biomedicine. Various principles of analysis are illustrated by immersion in exemplary methods of analysis, including the development and validation of these methods.

The subject also covers biomedicine, in which the emphasis – based on pathophysiology – is on correlations between diseases (or disease groups) and the results and importance of biomedical analyses to the prevention, diagnosis and treatment of patients.

The subject area covers:

Theory and skills related to general principles of analysis, and applied chemistry and physics, as well as the principles of analysis at bio-molecular, cell, tissue and organ level.

In order to qualify, work with and develop the exemplary analyses mentioned, applied statistics, quality assurance and enhancement, the working environment, safety and hygiene are also covered, along with biomedicine and core academic competences.

### **Natural and Health Sciences**

**60 ECTS credits**

Natural and Health Sciences helps students to acquire knowledge of human anatomy and biochemical and physiological processes, which serve as prerequisites for the ability to acquire the necessary qualifications in biomedical laboratory analysis. Students also develop the knowledge and competences to validate, assure the quality of and develop biomedical methods and principles of analysis.

The Health Sciences also teach students to evaluate the validity of the results of analyses in relation to an individual patient's analysis profile. In addition, students develop qualifications in relation to the development and implementation of strategies for disease-prevention and health-promotion for various population groups.

The subject area covers:

Chemistry, physics, biochemistry, molecular biology, biology, histology, microbiology, statistics, physiology and anatomy, immunology, research methodology, public-health science, health science and quality.

## **Social Science**

**20 ECTS credits**

Social Science illustrates the position of the biomedical laboratory technologist within the health system, both in terms of organisation and responsibility, and develops the students' ability to participate actively and constructively in debates about the health service, including about the development of their own profession. Students also learn to communicate directly and professionally with colleagues and other health professionals, as well as with donors, patients, relatives and others in the patient's social network. In addition, the Social Science helps them to develop knowledge of science theory, particularly the ability to relate to humanities and social-science research methodologies and results.

The subject area covers:

Communications, social psychology, theory of science, study technique, research methodology, cultural understanding, co-operation and the organisation, funding and function of the health service.

## **Humanities**

**5 ECTS credits**

Humanities helps students to develop the skills to analyse, understand and respect human values, culture, philosophies of life, living conditions, ideas, behaviour and reactions.

They develop the ability to reflect ethically on analysis-technology practice, and build up an ethical foundation that will form the basis of their dealings with the patient, relatives and others in the patient's network.

The subject area covers:

Ethics and academic ethics

## **Clinical training and theory classes**

The programme includes a theory classes corresponding to 135 ECTS credits and clinical training corresponding to 75 ECTS credits.

Theory is taught at the educational institution. The clinical training is provided by a medical-laboratory department approved by the institution.

# **3 Structure and organisation of the programme**

The programme is divided up into semesters and modules. Each academic year is divided up into two semesters. Each semester is divided up into two modules. A module is a separate programme



unit designed to enable the students to develop broad academic qualifications. Modules include theoretical and clinical elements or a combination of the two.

The programme consists of 14 modules. Each module is prescribed to 15 ECTS credits, with the exception of module 13 (10 ECTS credits) and 14 (20 ECTS credits).

Modules 1–12 start in weeks 6, 17, 35 and 46

Module 13 starts in weeks 6 and 35, and module 14 in weeks 12 and 41.

The individual institutions publish the actual dates of commencement for the modules they run.

The academic progression of the programme is such that students are generally expected to take the modules in the suggested order.

Local conditions at institutions may allow for the following exceptions:

- Module 3 can be taken before module 2
- Module 7 can be taken before module 6
- Module 10 can be taken before module 8
- Module 11 can be taken before module 9

The website for each educational institution describes the degree of flexibility it is able to accommodate.

The programme modules reflect key themes in profession. The subject areas covered by the programme are incorporated into the modules so students learn about the aspects of the work of a biomedical laboratory technologist on which the module focuses. The content of the subjects thus also addresses developments and changes in the profession, the whole area of analysis and laboratory technology, and the health-care sector.

The programme progresses academically and methodologically from the simple to the complex.

### **3.1 ECTS credits – European Credit Transfer System**

The programme is prescribed to a total of 210 ECTS credits, which includes theory classes corresponding to 135 ECTS credits and clinical training corresponding to 75 ECTS credits.

A student full-time equivalent (FTE) corresponds to 60 ECTS credits. An FTE covers every aspect of study before, during and after participation in both theory classes and clinical training. In this context, study is defined as self-study, assignments, projects, exams, etc.

## 3.2 Subjects and where they fit into in the programme

The allocation of ECTS credits per subject is shown in the table below:

Module	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total ECTS credits
General Principles of Analysis	2														
Applied Chemistry	1.5	0.5	1.5												
Applied Physics	0.5	0.5	1												
Analyses and Principles of Analysis at Bio-molecular, Cell, Tissue and Organ Level		5.5	3	8.5		4	5.5	3.5		7					
Biomedicine	1.5	1	0.5			1.5	3	2		1					
Applied Statistics	1.5											3			
Working Environment, Safety and Hygiene	2					1		0.5							
Quality Assurance and Enhancement	1.5	0.5		2		1	1	1		1.5		9			
Core Academic Competences					6										
<b>Biomedical Laboratory Analysis Total</b>	<b>10.5</b>	<b>8</b>	<b>6</b>	<b>10.5</b>	<b>6</b>	<b>7.5</b>	<b>9.5</b>	<b>7</b>	<b>9.5</b>	<b>9.5</b>	<b>10</b>	<b>12</b>	<b>7</b>	<b>12</b>	<b>125</b>
Chemistry			1.5	0.5		0.5	2.5								
Physics						1									
Biochemistry			2	0.5			2								
Biology		2				1		4							
Histology		2				1									
Microbiology			3							1					
Statistics			1.5	0.5			1								
Physiology and Anatomy		3				2.5									
Immunology			0.5							4.5					
Research Methodology															
Public Health Science					3			1.5							
Health Science and quality												1			
<b>Natural and Health Sciences Total</b>	<b>0</b>	<b>7</b>	<b>8.5</b>	<b>1.5</b>	<b>3</b>	<b>6</b>	<b>5.5</b>	<b>5.5</b>	<b>3.5</b>	<b>5.5</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>7</b>	<b>60</b>
Communications and Social Psychology	1			1	1	1									
Theory of Science, Study Techniques and Research Methodology	1.5		0.5		1							0.5			
Cultural Understanding and Co-operation	1.5			0.5											
The Organisation, Funding and Function of the Health Service					3	0.5		1				1.5			
<b>Social Sciences Total</b>	<b>4</b>	<b>0</b>	<b>0.5</b>	<b>1.5</b>	<b>5</b>	<b>1.5</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>0.5</b>	<b>20</b>
Ethics				1	1			1.5							
Academic Ethics	0.5			0.5											
<b>Humanities Total</b>	<b>0.5</b>	<b>0</b>	<b>0</b>	<b>1.5</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1.5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.5</b>	<b>5</b>
<b>Module Total</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>10</b>	<b>20</b>	<b>210</b>
Of which theory classes Total	7.5	15	15	3	12	10.5	9	15	15	9	2	6	1	15	135
Of which clinical training Total	7.5	0	0	12	3	4.5	6	0	0	6	13	9	9	5	75

	Compulsory module
	Interdisciplinary module
	Elective modules
	Bachelor

## 4 Modules

### 4.1 Module 1 – Practical Bioanalysis

#### Theme

The module consists of a broad introduction to the programme and profession. Based on the types of problem and domains with which the profession works, the module serves as an introduction to the programme and to professional practice. It also introduces basic study techniques and concepts of quality.

#### Objectives

The purpose of this module is to provide students with insight into the profession's distinctive features. Students expand their knowledge of the natural and health sciences and learn basic laboratory skills. They are introduced to the different types of test material that underpin medical-laboratory analyses, which includes developing an understanding of safety and ethical issues associated with the use and storage of such material. Finally, students are introduced to thinking about quality in all processes involved in medical-laboratory work, from taking samples to analysing results.

#### Learning objectives

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of selected exemplary laboratory analyses that illustrate the breadth of the profession
- knowledge of the working environment, security, hygiene, environmental considerations and professional ethics in relation to handling biological materials, chemicals and reagents
- knowledge of selected natural-science subject areas, which the student is able to apply in relation to selected bioanalytical and laboratory-technology work, including quality assurance
- knowledge of selected analyses' relevance to health and disease
- knowledge of the profession's development and position, enabling them, on a general level, to describe the profession in relation to health and patient care
- knowledge of ethics and basic communication theories, enabling them to recognise and draw upon these during contact with patients and donors, and well as other selected areas of bioanalysis
- knowledge of how to operate, with a degree of independence, basic laboratory-technical equipment, including microscopes, pipettes, scales and centrifuges
- knowledge of how to perform selected bio-medical analyses, via demonstration and under supervision
- knowledge of handling, with a certain degree of independence, biological materials, chemicals and reagents in a responsible manner that takes into account environmental and ethical considerations, the working environment, safety and hygiene
- knowledge of basic study techniques
- general competence to enter into collaboration with fellow students and future colleagues in a culturally diverse working environment.

## Allocation of subjects and ECTS credits

### Biomedical Laboratory Analysis 10½ ECTS credits

- *General principles of analysis:* Including using a microscope, centrifuge, and volumetric and photometric equipment (2 ECTS credits)
- *Applied chemistry:* General principles of chemical analysis, including volumetrics and introduction to chemical reactions (1½ ECTS credits)
- *Applied physics:* General principles of physics analysis, including theory of light in relation to microscopy and photometry (½ ECTS credit)
- *Biomedicine:* Relevance of selected analyses in relation to sickness and health (1½ ECTS credits)
- *Applied statistics:* Basic statistical concepts of relevance to quality assurance (1½ ECTS credits)
- *Working environment, safety and hygiene:* Including an introduction to the work of the medical laboratory, procedures, handling of biological materials, reagents and chemicals (2 ECTS credits)
- *Quality assurance and enhancement:* Including an introduction to quality-assurance procedures (1½ ECTS credits)

### Social Sciences 4 ECTS credit

- *Theory of science, study techniques and research methodology:* Including an introduction to the bioanalysis profession's basis and domains, and to information-gathering techniques (1½ ECTS credits)
- *Communication and social psychology:* Communication, including an introduction to basic communication theories (1 ECTS credit)
- *Cultural understanding and co-operation:* Including cultural theory and theories of co-operation of relevance to study and professional practice (1½ ECTS credits)

### Humanities ½ ECTS credit

- *Ethics (½ ECTS credit)*

Theoretical teaching	7½ ECTS credits
Clinical training	7½ ECTS credits
Total	15 ECTS credits

## Assessment

The module culminates in an internal clinical test.

The students' learning outcomes are assessed pass/fail.

## Module 2 – Basic human biology and bioanalysis

### Theme

The module focuses on basic human biology and bioanalysis. Biology, chemistry and physics subject areas are linked to selected exemplary analyses. Concepts of quality assurance are introduced in relation to the individual analyses.

### Objectives

The module prepares students to work with bioanalysis at cell, tissue and organ level. The students develop basic knowledge and skills that form the prerequisite for acquiring the qualifications to independently plan, execute and evaluate these analyses.

### Learning objectives

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of the human organism's structures and functions, enabling them to reproduce basic human-biological contexts and account for selected exemplary human-biological subjects as the background for analyses at cell, tissue and organ level
- knowledge of biology, chemistry and physics theory, enabling them to understand and account for selected exemplary analyses at cell, tissue and organ level
- knowledge of basic concepts of quality in relation to the above-mentioned analyses, enabling them to describe the quality of the analyses
- knowledge of natural-science working methods
- knowledge of how, under guidance and with a certain degree of independence, to perform selected exemplary human-biology tests at cell, tissue and organ level
- knowledge of how, under supervision, to apply relevant information in order to complete tasks and solve problems related to selected medical-laboratory analyses
- knowledge of exercising general care in performing analyses at cell, tissue and organ level
- knowledge of responsible conduct in a biomedical laboratory in relation to analysis work within the field of human biology
- knowledge of how to share responsibility for their own learning and evaluate their own efforts and outcomes

### Allocation of subjects and ECTS credits

Biomedical Laboratory Analysis 8 ECTS credits

- *Analyses and principles of analysis at bio-molecular, cell, tissue and organ level:* Studies and analyses based on the registration of physiological quantities. Studies and analyses that characterise the function of organs and organ systems, including recording electrical impulses. Morphological analyses at cell and tissue level, based on the detection of the characteristics of human cells and tissue (5½ ECTS credits)
- *Quality assurance and enhancement:* Basic concepts in quality assurance in relation to the analyses presented during the module (½ ECTS credit)
- *Applied physics:* Recording the organism's electrical impulses (½ ECTS credit)
- *Applied chemistry:* Non-organic and organic molecules' interactions in relation to the analyses presented during the module (½ ECTS credit)
- *Biomedicine:* Understanding selected exemplary pathological processes (1 ECTS credit)

Natural and Health Sciences 7 ECTS credits

- *Biology*: Basic cell biology (2 ECTS credits)
- *Physiology and anatomy*: The theoretical basis for analyses and principles of analyses at organ level, including selected organs and organ systems (3 ECTS credits)
- *Histology*: The theoretical basis for selected analyses of human tissue, including tissue types and pre-analysis (2 ECTS credits)

Theoretical teaching	15 ECTS credits
Clinical training	0 ECTS credits
Total	15 ECTS credits

### **Assessment**

The module culminates in an internal theory test.

The students' learning outcomes are assessed according to the 7-point grading scale.

## 4.3 Module 3 – Basic human biology and bioanalysis

### Theme

The module focuses on selected exemplary biochemical and microbiological analysis in the medical-laboratory field. Students learn about the relationship between analyses and their use in connection with the diagnosis, prognosis and treatment of patients.

### Objectives

The module prepares students for work on biochemical and microbiological analyses. They learn basic knowledge and skills that form the prerequisite for acquiring the qualifications to independently plan, execute and evaluate such analyses. The work is based on selected exemplary biochemical analyses and methods of cultivation, and on the identification of micro-organisms.

### Learning objectives

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of chemistry and biochemistry, enabling them to account for the principles behind and deployment of selected exemplary analyses based on biochemical processes
- knowledge of microbiology, enabling them to account for selected microbiological methods and analyses
- knowledge of biomedicine, enabling them to account for pathological processes related to selected analyses
- knowledge of statistics and basic concepts of quality in relation to the above-mentioned analyses, enabling them to describe the quality of analyses
- knowledge of physics, enabling them to account for the principles behind and deployment of selected exemplary analyses, including photometry
- knowledge of natural-science working methods
- knowledge of how, under supervision, to plan, perform, document and justify selected exemplary biochemical analyses
- knowledge of how, under supervision, to plan, perform, document and justify selected exemplary microbiological analyses
- knowledge of how, under supervision, to deploy information in order to complete tasks and solve problems related to selected medical laboratory analyses
- knowledge of how to exercise general care in performing biochemical and microbiological analyses
- knowledge of responsible conduct in a biomedical laboratory in relation to biochemical and microbiological analyses
- knowledge of how to share responsibility for their own learning and evaluate their own efforts and outcomes

### Allocation of subjects and ECTS credits

*Biomedical Laboratory Analysis 6 ECTS credits*

- *Analyses and principles of analysis at bio-molecular, cell, tissue and organ level:* Studies and analyses based on direct or indirect detection of molecules and ions, including basic enzymatic analysis. Analyses and principles of analysis at cellular level, including in relation to the detection of a number of micro-organisms, their characteristics and functions (3 ECTS credits)
- *Applied chemistry:* The interaction of molecules in relation to the analyses presented during the module (1½ ECTS credits)

- *Applied physics*: The use of photometric methods, e.g. to determine the concentration of molecules and ions, including the structure and function of selected exemplary equipment (1 ECTS credit)
- *Biomedicine*: Pathological processes in relation to the biochemical and/or microbiological analyses presented during the module (½ ECTS credit)

*Natural and Health Sciences 8,5 ECTS credits*

- *Chemistry*: The theoretical basis for understanding molecules' interactions in relation to the analyses presented during the module, including reaction theory and acid-base theory (1½ ECTS credits)
- *Biochemistry*: The theoretical basis for analyses and principles of analyses at bio-molecular level, including selected parts of dynamic and descriptive biochemistry and the structure of biological macro-molecules (2 ECTS credits)
- *Microbiology*: The theoretical basis for selected exemplary microbiological methods and analyses, including the morphology, growth and pathogenesis of micro-organisms (3 ECTS credits)
- *Statistics*: The theoretical basis for interpretation of the validity, signal value, variation and distribution of analysis results, as well as basic quality control (1½ ECTS credits)
- *Immunology* (½ ECTS credit)

*Social Sciences (½ ECTS credit)*

- *Theory of science, study techniques and research methodology*: Reflections on knowledge and knowledge generation in relation to bioanalytical work (½ ECTS credit)

Theoretical teaching	15 ECTS credits
Clinical training	0 ECTS credits
Total	15 ECTS credits

**Assessment**

The module culminates in an internal theory test.

The students' learning outcomes are assessed according to the 7-point grading scale.



## 4.4 Module 4 – Bioanalytical quality assurance

### Theme

The module combines practical and factual knowledge in selected areas of laboratory medicine. The focus is on methods of control, quality assurance and ethics, as well as contact with patients and/or donors. Finally, the module helps students to develop a professional identity and the ability to work in teams.

### Objectives

The module aims to provide students with experience of combining theory and methodology in order to perform bioanalysis in practice-oriented contexts, particularly using control methods and understanding the relevance of quality assurance. The module supports students in encounters with patients and donors and helps them to develop an ethical basis for their practice. It also provides insight into fundamental ethical issues in relation to bioanalytical work in practice. Finally, the module helps students develop a professional identity.

### Learning objectives

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of basic quality-assurance methods, enabling them to account for the procedures used
- knowledge of the relationship between theory and practice, enabling them to identify and formulate issues relevant to conducting bioanalytical work
- knowledge of ethical positions, enabling them to relate to bioethical issues
- knowledge of ethical dilemmas, enabling them to describe aspects of encounters with patients and donors
- knowledge of how, with a degree of independence and insight, to perform selected analyses
- knowledge of how, under supervision, to assess the quality of the analyses conducted
- knowledge of how, with a certain degree of independence and insight, to act in a professional manner in encounters with patients and/or donors
- knowledge of how to relate to the profession and its position relative to other health-care professions
- knowledge of how to demonstrate responsibility for the evaluation of the results of analyses
- knowledge of how to work with other professionals in a professional medical-laboratory context

### Allocation of subjects and ECTS credits

Biomedical laboratory analyses 10½ ECTS credits

- *Analyses and principles of analysis at bio-molecular, cell, tissue and organ level*: Studies and analyses based on direct or indirect detection of molecules and ions, e.g. enzymatic analysis. Morphological analyses at cell and tissue level, based on detection of the characteristics of human cells and tissues. Studies and analyses based on the registration of physiological quantities. Studies and analyses that characterise the function of organs and organ systems (8½ ECTS credits)
- *Quality assurance*: Basic quality-assurance methods in relation to selected exemplary analyses, including pre-analytical quality control (2 ECTS credits)

Natural and Health Sciences 1½ ECTS credits

- *Chemistry*: The theoretical basis for understanding non-organic and organic molecules' interactions in relation to the analyses presented during the module (½ ECTS credit)
- *Biochemistry*: The theoretical basis for analyses and the principles of analyses at bio-molecular level, e.g. enzymology, macro-molecules and selected parts of dynamic biochemistry (½ ECTS credit)
- *Statistics*: Application of statistical methods for quality assurance (½ ECTS credit)

#### Social Sciences 1½ ECTS credits

- *Cultural understanding and co-operation*: Theoretical perspectives on professional identity (½ ECTS credit)
- *Communications and social psychology*: Theoretical concepts, including social psychology, for understanding the encounter with the patient (1 ECTS credit)

#### Humanities 1½ ECTS credits

- *Professional Ethics*: Professional ethical dilemmas (½ ECTS credit)
- *Ethics*: Basic ethical positions (1 ECTS credit)

Theoretical teaching	3 ECTS credits
Clinical training	12 ECTS credits
Total	15 ECTS credits

#### **Assessment**

The module culminates in an internal clinical test.

The students' learning outcomes are assessed according to the 7-point grading scale.

## 4.5 Module 5 – Interdisciplinary teamwork

### Theme

The module is run in collaboration with several medium-cycle health-education programmes, and focuses on the specific domains of individual health-care professions. The objective is to create fertile ground for a multi-disciplinary foundation and teamwork.

### Objectives

A key requirement for professional bioanalysis within the health service is that it takes place in close interaction with other health-care professions, so that diagnosis, treatment, care and rehabilitation are characterised by maximum quality and cohesion for the individual patient. The purpose of this module is for students to develop competences in this form of teamwork. Another objective is to boost the students' identity as biomedical laboratory technologists and their knowledge of the fields in which the profession is engaged by collaborating with other health professionals on both theoretical and practical issues.

### Learning objectives

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of general methods of documentation, development and assurance of quality in healthcare provision, enabling them to account for these both in relation to their own profession and in interaction with other healthcare professions
- knowledge of other healthcare professionals' competences, enabling them to identify and designate these competences
- knowledge of the profession's domains/tasks, working practices (methods, concepts, tools, knowledge) and main assumptions (justifications for doing the work), enabling them to distinguish and discuss the various professions' competences and areas of work
- knowledge of the structure, organisation and position in society of the health service, as well as the ethical, legal, political and financial frameworks that underpin the sector's work, on a level that enables them to account for and discuss general issues relating to the field
- knowledge of how, with a certain degree of independence and insight, to apply selected biomedical analyses to the study of health-care issues and to solve problems in collaboration with other health professions
- knowledge of how, with a certain degree of independence and insight, to communicate selected bio-medical analyses' natural- and health-science justifications
- knowledge of how, with a certain degree of independence, to search for, communicate and apply literature and other materials associated with health-care issues that are linked to or extend beyond the profession's core competences
- knowledge of how, with a certain degree of independence and insight, to use ICT for documentation and quality assurance
- knowledge of how to engage in interdisciplinary collaboration and problem-solving that incorporates knowledge of and respect for their own and other professions' responsibilities and competences

### Allocation of subjects and ECTS credits

Biomedical Laboratory Analysis 6 ECTS credits

- *Core competences:* Bioanalysts' responsibilities, competences and core competences in relation to the natural sciences and health sciences, including the use of health- and natural-

science theory in conducting and communicating about biomedical analysis (6 ECTS credits)

Natural and Health Sciences 3 ECTS credits

- *Public-health science*: Including communications, health education and health concepts (3 ECTS credits)

Social Sciences 5 ECTS credit

- *The organisation, and function of the health service*: Including the structure of the health service, its organisation and position in society, health economics and health policy, legal aspects of the work of the health service, the patient/citizen/user's legal rights, methods of quality enhancement and documentation (3 ECTS credits)
- *Communications and social psychology*: Including health-related information technology (1 ECTS credit)
- *Theory of science, study techniques and research methodology* (1 ECTS credit)

Humanities 1 ECTS credit

- *Ethics*: Including views of human nature, basic ethics in relation to interdisciplinary collaboration, ethical questions, dilemmas, values and attitudes (1 ECTS credit)

Theoretical teaching	12 ECTS credits
Clinical training	3 ECTS credits
Total	15 ECTS credits

### **Assessment**

The module culminates in an internal theory test.

The students' learning outcomes are assessed according to the 7-point grading scale.

## 4.6 Module 6 – Advanced human biology and bioanalysis

### Theme

The module, which builds on Module 2, represents an extension of the programme's human-biology focus, with special emphasis on the use of medical-laboratory analysis in relation to pathological conditions. The module focuses on the analysis and diagnosis of pathological conditions, including the use of radio-physics principles, by incorporating selected exemplary human-biology subjects.

### Objectives

The objective is to further develop the students' competences in the planning, execution and evaluation of analyses at cell, tissue and organ level, as well as their ability to explain the pathological findings.

### Learning objectives

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of the structure of the human organism, its functions and pathological conditions, enabling them to interpret and discuss selected exemplary analysis results at cell, tissue and organ level
- knowledge of selected exemplary analysis results at cell, tissue and organ level, enabling them to evaluate and explain links between analysis results and disease mechanisms and progression
- knowledge of radio-pharmacy and basic radio-physics principles and their application within the field of nuclear medicine, enabling them to explain nuclear-medicine methodology
- knowledge of concepts of quality in relation to selected analyses, enabling them to account for the quality of analysis
- knowledge of legislation in relation to radioactive pharmaceuticals
- knowledge of legislation and ethical issues in relation to bio-banks
- knowledge of how, with a certain degree of independence, to perform selected exemplary analyses at cell, tissue and organ level
- knowledge of how, with a certain degree of independence, to handle radioactive materials in accordance with legislation
- knowledge of responsible conduct in analysis work, with a view to teamwork, safety and environmental considerations
- knowledge of how to realise their own potential and ambitions, enabling them to develop professionally and personally
- knowledge of communication competences in relation to professional encounters with patients and their relatives
- knowledge of how to reflect on the way in which people's life situations and conditions affect their psychological responses to health and disease

### Allocation of subjects and ECTS credits

Biomedical Laboratory Analysis 7½ ECTS credits

- *Analyses and principles of analysis at bio-molecular, cell, tissue and organ level:* Morphological analyses at cell and tissue level, based on detection of the characteristics of human cells and tissues. Physiological studies and analyses that characterise the function of organs and organ systems, e.g. analysis and study via radioactive tracers and measuring of electrical impulses in the organism (4 ECTS credits)

- *Quality assurance and enhancement*: Basic concepts in quality assurance in relation to the analyses presented during the module (1 ECTS credit)
- *Working environment, safety and hygiene*: Radio-pharmacy and radiation biology in relation to the safe use of radioactive pharmaceuticals (1 ECTS credit)
- *Biomedicine*: Pathophysiology and pathology, including the relationship between physiological analysis and findings, as well as between pathological processes and disease. Pathologic anatomy, including the relationship between cell and tissue-based analysis and examination findings, as well as between pathological processes and disease (1½ ECTS credits)

#### Natural and Health Sciences 6 ECTS credits

- *Biology*: Cell Biology: The theoretical basis for analyses and principles of analyses of human cells (1 ECTS credit)
- *Physiology and anatomy*: Physiology: The theoretical basis for physiological studies and analyses, including the use of radioactive tracers (2½ ECTS credits)
- *Histology*: The theoretical basis for analysis of human tissue (1 ECTS credit)
- *Physics*: Radio-physics principles, including radio physics, dosimetry and methods of measurement, including physiological measurement principles, e.g. recording electrical impulses from the organism (1 ECTS credit).
- *Chemistry*: The theoretical basis for colouring cells and tissue (½ ECTS)

#### Social Sciences 1½ ECTS credit

- *Communications and social psychology*: For example, psychological reactions in relation to health and sickness, and the importance in this context of the patient's life situation and living conditions (1 ECTS credit)
- *The organisation and function of the health service*: Including bio-banks, committee systems, protection of the individual and patients' rights (½ ECTS credit)

Theoretical teaching	10½ ECTS credits
Clinical training	4½ ECTS credits
Total	15 ECTS credits

#### Assessment

The module culminates in an external theory test.

The students' learning outcomes are assessed according to the 7-point grading scale.

## 4.7 Module 7 – Advanced biochemistry and bioanalysis

### Theme

The module focuses on chemical and biochemical analyses and results, and on interpreting them in connection with the diagnosis, prognosis and treatment of patients. Biomedical problems are treated in an interdisciplinary manner based on selected disease groups. In this context, priority is given to extending chemical, biochemical and statistical theory.

### Objectives

The module qualifies students to evaluate chemical and biochemical analysis, and to interpret and reflect on the importance of normal and deviant analysis results in relation to the body's normal function and diseases. It also develops the students' qualifications to plan and conduct such analyses.

### Learning objectives

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of chemistry, biochemistry, pathophysiology and pharmacology, enabling them to understand and explain analyses and results based on biochemical processes
- knowledge of selected exemplary biochemical and pathophysiological links, enabling them to interpret and evaluate the significance of normal and deviant results of chemical and biochemical analyses
- knowledge of how, with a certain degree of independence, to plan, conduct, document and justify selected exemplary chemical and biochemical analyses
- knowledge of how to seek out, acquire, evaluate and incorporate new knowledge in relation to the profession and its development
- knowledge of responsible conduct both in analysis work and in relation to teamwork, safety and environmental considerations
- knowledge of how to plan, conduct, document and evaluate selected existing chemical and biochemical analyses, e.g. in relation to the analyses' technological, working-environment, prophylactic, diagnostic and treatment contexts
- knowledge of how to make further progress professionally and personally

### Allocation of subjects and ECTS credits

Biomedical Laboratory Analysis 9½ ECTS credits

- *Analyses and principles of analysis at bio-molecular, cell, tissue and organ level:* Selected exemplary analyses, including bio-molecular analysis principles (5½ ECTS credits)
- *Quality assurance and enhancement:* Basic concepts in quality assurance in relation to the analyses presented during the module (1 ECTS credit)
- *Biomedicine:* Pathophysiology: The relationship between biochemical analysis results and pathological processes and disease. Pharmacology: The relevance of selected exemplary pharmaceutical analyses. Haematology and haemostasis: Correlations between haematological and haemostasis-related analyses and pathological processes and diseases (3 ECTS credits)

Natural and Health Sciences 5½ ECTS credits

- *Chemistry:* Molecules' interactions in relation to chemical and biochemical analyses, including electrometry (2½ ECTS)

- *Biochemistry*: The theoretical basis for analyses and principles of analyses at bio-molecular level, including enzyme-kinetics and selected parts of descriptive and dynamic biochemistry (2 ECTS credits)
- *Statistics*: Statistical concepts related to the variability and uncertainty of the results of analyses, and basic hypothesis testing (1 ECTS credit)

Theoretical teaching	9 ECTS credits
Clinical training	6 ECTS credits
Total	15 ECTS credits

### **Assessment**

The module culminates in an external theory test.

The students' learning outcomes are assessed according to the 7-point grading scale.



## 4.8 Module 8 – Molecular-biology and genetic analyses

### Theme

The module focuses on the application of molecular biological techniques in bioanalysis. The module links theoretical understanding of genetics and molecular biology with biomedicine and real-life laboratory analyses. It also deals with ethical and social issues associated with developments in the field.

### Objectives

The module provides students with fundamental knowledge of genetics, as well as knowledge of the principles behind representative molecular-biological techniques and the qualifications needed to apply them. The main objective is that students develop a reflective understanding of how and when molecular-biology techniques can and should be used for genotyping, screening, diagnosis and treatment.

### Learning objectives

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of selected exemplary diseases and disease groups, including genetic disorders, disease development, prognosis, diagnosis and treatment options, enabling them to explain and discuss the links and differences between individual diseases and disease groups
- knowledge of the principles behind selected molecular biological analyses and techniques, as well as an understanding of their theoretical biological, biochemical and chemical basis, at a level that enables them to explain, compare and discuss different analytical principles and their areas of usage
- knowledge of the content and use of relevant bioinformatics in the development and interpretation of molecular-biological analyses, enabling them to explain and discuss this use
- knowledge of public health-science and health-economic concepts and issues related to molecular-genetic individual diagnosis and screening (diagnostic, carrier and predictive), enabling them to account for basic problems and relate them to bioanalysis
- knowledge of bio-ethical positions and methods of ethical reflection and analysis, enabling them to differentiate between, compare and discuss perspectives on given ethical issues related to the use of selected molecular-biology techniques in the health service in Denmark and internationally
- knowledge of how to discuss scientific texts and research dealing with issues related to molecular biology
- knowledge of how, independently, to plan, conduct, evaluate, justify and communicate selected exemplary molecular-biology analyses in a biomedical context, taking into account current legislation, environmental and safety issues, and public-health science perspectives
- knowledge of how, independently, to conduct an ethical analysis, on both an individual and a social level, of selected issues related to molecular biology and to reflect on them in a global context
- knowledge of how, in a responsible and reflective manner, to work with bioanalysis in a molecular-biology laboratory
- knowledge of how to reflect on bio-ethical issues

### Allocation of subjects and ECTS credits

Biomedical Laboratory Analysis 7 ECTS credits

- *Analyses and principles of analysis at bio-molecular, cell, tissue and organ level:* Molecular biological techniques, e.g. purification and propagation of nucleic acids, separation techniques, cloning, sequencing and detection of changes at chromosome and gene level (3½ ECTS credits)
- *Quality assurance and enhancement:* Quality assurance in relation to the above-mentioned analyses (1 ECTS credit)
- *Working environment, safety and hygiene:* Environmental and safety issues and legislation related to molecular biology research and analysis (½ ECTS credit)
- *Biomedicine:* The link between molecular biological understanding and pathological conditions, e.g. hereditary diseases, chromosome changes and cancer (2 ECTS credits)

#### Natural and Health Sciences 5½ ECTS credits

- *Biology:* Cell biology: The theoretical basis for molecular-biological analysis principles. Molecular biology: The theoretical basis for molecular-biological analysis principles, including gene regulation, translation, mutations and other changes at chromosome and gene level. Genetics: Biological inheritance and inheritance mechanisms, genotype and phenotype in relation to molecular-genetic analyses (4 ECTS credits)
- *Public-health science:* Including genetic testing and screening in health promotion and disease prevention, both in Denmark and in a global perspective (1½ ECTS credits)

#### Social Sciences 1 ECTS credits

- *The organisation and function of the health service:* Including health-economic perspectives on screening (1 ECTS credit)

#### Humanities 1½ ECTS credits

- *Ethics:* Including bioethical positions, methods of ethical reflection and analysis, and ethics in a global perspective (1½ ECTS credits)

Theoretical teaching	15 ECTS credits
Clinical training	0 ECTS credits
Total	15 ECTS credits

#### Assessment

The module culminates in an internal theory test.

The students' learning outcomes are assessed according to the 7-point grading scale.

## 4.9 Module 9 – Biomedical laboratory analysis in an interdisciplinary perspective

### Theme

The module focuses on the application of biomedical analysis methods in clinical, developmental and research contexts. The module links the theoretical basis for selected exemplary methods of analysis, cutting across medical-laboratory areas of specialisation with their practical application in diagnostics, research and disease control. The starting point for the module and its sub-elements is either the use of a particular methodological approach (e.g. molecular-biological analysis methods) cutting across medical-laboratory areas of specialisation, or in interdisciplinary, biomedical approaches to diagnosis, treatment and prevention in a specific disease or disease group (e.g. cancer).

### Objectives

The purpose of this module is to provide students with in-depth insight into the principles behind the selected methods and their potential applications across the laboratory-medical areas of specialisation and in relation to selected disease groups. The objective is therefore to develop the students' ability to analyse, discuss and put into perspective examinations, knowledge and results, partly on the basis of the medical-laboratory methods and diagnoses illustrated in the module.

### Learning objectives

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of selected biomedical problems at a level that enables them to discuss these issues in relation to relevant analytical methods
- knowledge of the principles behind selected analyses and techniques, and understanding of the theoretical natural-science basis on which the analyses are based, at a level that enables them to discuss different principles of analysis and their areas of application
- knowledge of social- and public-health science concepts and issues related to the application of medical-laboratory methodology, e.g. diagnosis and screening, enabling them to discuss basic problems and relate them to bioanalysis
- knowledge of how, independently, to select, discuss and use scientific texts and research results in a given medical-laboratory context
- knowledge of how, independently, to plan, conduct, justify and communicate selected exemplary analyses in a biomedical context, taking into account both theory and methodological approaches (e.g. legislation), as well as environmental and safety issues and public-health science perspectives

### Allocation of subjects and ECTS credits

Biomedical Laboratory Analysis 9½ ECTS credits

- *Analyses and principles of analysis at bio-molecular, cell, tissue and organ level*
- *Quality assurance and enhancement*
- *Working environment, safety and hygiene*
- *Biomedicine*

Natural and Health Sciences 3½ ECTS credits

- *Biology*: Including molecular biology, microbiology and immunology
- *Chemistry*

- *Biochemistry*
- *Physiology and anatomy*
- *Physics*
- *Research methodology*
- *Public health science*

Social Sciences 2 ECTS credit

- *The organisation, funding and function of the health service*
- *Theory of science, study techniques and research methodology*

Theoretical teaching	15 ECTS credits
Clinical training	0 ECTS credits
Total	15 ECTS credits

### **Assessment**

The module culminates in an internal theory test.

The students' learning outcomes are assessed according to the 7-point grading scale.

## 4.10 Module 10 – Immunochemical analyses

### Theme

The module focuses on methods of immunology analysis based on antigen/antibody reactions in relation to the use of these methods, e.g. for monitoring and diagnosis. The module links immunochemical analyses and the subject areas that form the theoretical background for the analyses.

### Objectives

The module provides students with insight into working with immunochemical analyses, and qualifies them to plan, conduct, quality-assure, communicate and justify the use of the tests. The module also teaches students about the human immune system and its significance in relation to diseases.

### Learning objectives

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of the immune system's basic structure, enabling them to account for and explain the interaction between cellular and humoral immune responses
- knowledge of antigen/antibody reactions, enabling them to account for and discuss how these are used to detect human biomolecules
- knowledge of immunochemical methodology, enabling them to explain and discuss how these are used in screening, diagnosis and treatment
- knowledge of how, with a high degree of independence and a certain degree of routine, to plan and conduct selected exemplary immunochemical analyses
- knowledge of how to communicate the immune system's role in health and disease
- knowledge of how to justify the use of immunochemical methods in (and their relevance to) diagnosis, screening, treatment and monitoring
- knowledge of how, with a certain degree of independence, to perform quality assurance, including the use of control systems
- knowledge of how to reflect on and evaluate the potential applications of immunochemical analyses in medical-laboratory wards, including ethical considerations

### Allocation of subjects and ECTS credits

Biomedical Laboratory Analysis 9½ ECTS credits

- *Analyses and principles of analysis at bio-molecular, cell, tissue and organ level:* Examinations and analyses based on the principles of immunochemical analysis, which detects antigens and antibodies by detecting bindings between them (7 ECTS credits)
- *Quality assurance and enhancement:* Laboratory work, in compliance with quality-assurance procedures, e.g. certification and accreditation requirements (1½ credits)
- *Biomedicine:* The correlation between analysis and examination results and selected exemplary pathological processes (1 ECTS credit).

Natural and Health Sciences 5½ ECTS credits

- *Immunology:* The theoretical basis for the immune system and immune responses, and for analyses and examinations based on this (4½ ECTS)

- *Microbiology*: The theoretical basis for development of infections, including the importance of micro-organisms (especially viruses) in selected exemplary immunochemical analyses (1 ECTS credit)

Theoretical teaching	9 ECTS credits
Clinical training	6 ECTS credits
Total	15 ECTS credits

### **Assessment**

The module culminates in an external theory test.

The students' learning outcomes are assessed according to the 7-point grading scale.

## 4.11 Module 11 – Clinical module

In module 11, students choose one of the following clinical modules:

- Clinical Biochemistry
- Clinical Physiology and Nuclear Medicine
- Clinical Immunology
- Clinical Microbiology
- Clinical Neurophysiology
- Pathological Anatomy

### **Theme**

The module focuses on themes in one of the above-mentioned medical-laboratory areas of specialisation. It focuses on the use of selected methods of analysis relevant to the selected area of specialisation in a clinical, developmental and research perspective. The module links the theoretical basis for the selected exemplary methods of analysis with their practical applications in diagnostics, research and disease control. The focus is also on quality assurance and enhancement in relation to the methods concerned.

### **Clinical Biochemistry**

Based on selected clinical biochemical problems and associated methods of biochemical analysis, including key organ-specific biochemical analyses and more specialised analyses, e.g. DNA-based, pharmacological or immunological methods. The module includes relevant biomedical problems such as diagnosis of organ-related diseases. Also included are public-health and social-science issues relevant to clinical biochemistry, e.g. the patient's experience of quality, coherence and care in the health service, as well as social pharmacy.

### **Clinical Physiology and Nuclear Medicine**

Based on selected clinical physiology and nuclear-medicine issues and associated methods of analysis, including those related to organ-related visual and functional diagnostic examinations. The module covers relevant biomedical problems. It also includes public-health and social-science issues relevant to clinical physiology and nuclear medicine, including laws and ministerial orders pertaining to work with radioactivity (in hospital laboratories, etc.) and radioactive medicines.

### **Clinical Immunology**

Based on selected clinical-immunological problems and associated immunological methods of analysis, including DNA-based and immunochemical. The module includes relevant biomedical problems such as screening, diagnosis and treatment. Also included are public-health and social-science issues relevant to clinical immunology, e.g. prioritisation in the health service and patients' and donors' experience of quality, coherence and care in the health service.

### **Clinical Microbiology**

Based on selected clinical microbiological problems and associated microbiological methods of analysis, including quantitative and qualitative decisions based on traditional microbiological and, if relevant, molecular-biological methods of analysis. The module includes relevant biomedical problems, e.g. resistance and nosocomial infections, diarrhoea (including travel-related conditions), and complications in immunosuppressive and sexually transmitted diseases. Also included are public-health and social-science issues relevant to clinical microbiology, e.g. the development of resistance, epidemiology and infectious diseases in a global perspective, as well as treatment and prophylaxis.

### **Clinical Neurophysiology**

Based on selected clinical neuro-physiological problems and associated methods of analysis, including electroencephalography (EEG), electronystagmography/electromyography (ENG/EMG) and evoked potentials (EP). The module includes relevant biomedical issues with an emphasis on neurological diseases. The focus is on the nervous system and the senses' anatomy, basic neurophysiology and neurological diseases. Also included are public-health and social-science issues relevant to clinical neurophysiology, including special circumstances regarding contact with patients during analyses conducted over prolonged periods.

### **Pathological Anatomy**

Based on selected pathological anatomical problems and associated histological and cytological methods of analysis, including conventional histo- and/or cytochemical colouring methods, immunohisto-/cytochemical analyses and more recent molecular biological analyses. The module includes relevant biomedical problems, e.g. diagnosis of pathological changes in histological and/or cytological material. Also included are public-health and social-science issues relevant to pathological anatomy, e.g. screening examinations for cervical cancer.

### **Objectives**

The purpose of this module is to provide students with in-depth insight into the principles behind the chosen methods and their potential applications in relation to the medical-laboratory area of specialisation. The objective is, therefore, to develop students' competences in analysing and discussing the medical-laboratory methods illustrated in the module, in relation to both a biomedical and a quality and development perspective.

### **Learning objectives**

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of selected biomedical problems in relation to the area of specialisation concerned, at a level that enables them to discuss these issues in relation to relevant methods of analysis
- knowledge of the principles behind the selected analyses and techniques, and understanding of the theoretical natural-science basis for the analyses, at a level that enables them to discuss different principles and their areas of use, including quality assurance of the analyses
- knowledge of social-science and public-health science concepts and issues related to the areas of specialisation concerned, enabling them to discuss the problems concerned and relate them to bioanalysis
- knowledge of how, independently, to select, discuss and use scientific texts and research results in a relevant laboratory-medical context
- knowledge of how, independently, to plan, conduct, justify and communicate selected exemplary analyses in a biomedical context, including making an independent contribution to quality assurance and enhancement of the analytical approach
- knowledge of how to, independently and responsibly, to work on bioanalysis in a specialist laboratory

### **Allocation of subjects and ECTS credits**

Biomedical Laboratory Analysis 10 ECTS credits

- *Analyses and principles of analysis at bio-molecular, cell, tissue and organ level*
- *Quality assurance and enhancement*
- *Working environment, safety and hygiene*



- *Biomedicine*

Natural and Health Sciences 4 ECTS credits

- *Biology*: Including molecular biology, microbiology and immunology
- *Histology*
- *Chemistry*
- *Biochemistry*
- *Physiology and anatomy*
- *Physics*
- *Research methodology and statistics*
- *Public-health science, health science and quality*

Social Sciences 1 ECTS credit

- *The organisation, funding and function of the health service*
- *Theory of science, study techniques and research methodology*

Theoretical teaching	2 ECTS credits
Clinical training	13 ECTS credits
Total	15 ECTS credits

### **Assessment**

The module culminates in an internal clinical test.

The students' learning outcomes are assessed according to the 7-point grading scale.

## 4.12 Module 12 – Bioanalytical development and quality assurance

### Theme

The module deals with quality (including assurance and enhancement work) in the health service, with a focus on natural-science working methods. Also included are statistical planning of experiments, and evidence-based criteria for the examination, evaluation and securing of established and emerging methods of analysis, in terms of their validity, reliability and legitimacy.

### Objectives

The objective of the module is to qualify students to use and combine statistical tools and relevant evidence-based procedures for the development, evaluation and securing of the quality of established and new analyses, as a prerequisite for subsequent safe and development-oriented bioanalysis. Another objective is to qualify students to work in the health service in a manner that takes into account different quality parameters, both within their own work and in relation to the organisation as a whole, and promotes coherent patient care.

### Learning objectives

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of statistics, enabling them to explain and discuss the statistical design of experiments, as well as statistical studies and tests related to quality assurance and the validation of equipment and methodology
- knowledge of quality-assurance procedures, enabling them to discuss and interpret the parameters of evidence-based validation
- knowledge of welfare-state theory, health economics and organisational theory, enabling them to discuss priorities in the development of both the profession and the health service in general
- knowledge of choices of scientific method
- knowledge of how, independently, to comply with quality-assurance procedures, and how, with a certain degree of independence, to participate in the development of control and security procedures in relation to the quality of analyses and examinations
- knowledge of how, with a high degree of independence and insight, to participate in the planning and performing of bioanalytical experiments and the deployment of new equipment or new methods of analysis based on statistical evidence
- knowledge of how to contribute to the development of quality-assurance work and biomedical analyses
- knowledge of how to identify quality and development challenges and problems in relation to analysis, laboratory work, diagnostics, the health service and society, and to act constructively, responsibly and in a manner that solves problems related thereto

### Allocation of subjects and ECTS credits

Biomedical Laboratory Analysis 12 ECTS credits

- *Quality assurance and enhancement*: Statistical experiment planning, quality assurance and method validation (9 ECTS credits)
- *Applied statistics*: The statistical basis for experiment planning, quality assurance and method validation (3 ECTS credits)

Natural and Health Sciences 1 ECTS credit

- *Health science and quality*: Accreditation and evidence basing, e.g. good practice (GXP) and medical technology evaluation (MTV) (1 ECTS credit)

Social Sciences 2 ECTS credits

- *The organisation and function of the health service*: Welfare-state theory and health economics in relation to quality and priorities in the health service, e.g. MTV (1 ECTS credit)
- *Theory of science, study techniques and research methodology*: Different research approaches (e.g. quantitative vs. qualitative) and related science-theory and research-methodology problems, e.g. in relation to MTV (1 ECTS credit).

Theoretical teaching	6 ECTS credits
Clinical training	9 ECTS credits
Total	15 ECTS credits

**Assessment**

The module culminates in an internal clinical test.

The students' learning outcomes are assessed according to the 7-point grading scale.

## **4.13 Module 13 – Elective module: Knowledge of bioanalytical practice, development and research**

### **Theme**

The elective module expands upon subjects and themes already covered in the programme, or it can supplement the programme by incorporating relevant new areas or more specialised areas relevant to the profession and its practice.

The module provides students with the opportunity to work on a subject or a technology not otherwise presented in the course of the programme, or to take a subject that has already been broached during the programme and study it in greater depth in a practice- and development-oriented context.

The elective module can be taken either at the educational institution where the student is enrolled or at another institution in Denmark or abroad.

The individual institutions describe the elective modules offered and publish timetables for them on their websites.

Descriptions of the individual modules and registration procedures are published on the health programmes' joint website ([www.sundhedsuddannelse.dk](http://www.sundhedsuddannelse.dk)). Deadlines for application are the same for all programmes at Professional Bachelor level.

The institution offering an elective module is responsible for agreements, level, assessment, etc.

The institution in which the student is enrolled must approve the elective module.

### **Objectives**

The module provides students with the opportunity to immerse themselves in a chosen subject in order to develop professional qualifications in bioanalytical development work.

### **Learning objectives**

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of one or more healthcare areas, enabling them to discuss the development of the profession
- knowledge of how to select and evaluate practice-, development- and research-based knowledge relevant to the profession and to working in healthcare, in relation to a given problem
- knowledge of how, with a high degree of independence, to perform and evaluate new laboratory-technology procedures and to identify opportunities and barriers in relation to their implementation
- knowledge of how to contribute to development and research work relevant to the profession and to health-care work
- knowledge of how to reflect on the profession's core competences and development potential

- knowledge of how to reflect on their own professional and personal resources as well as potential areas for development

### **Allocation of subjects and ECTS credits**

Biomedical Laboratory Analysis 7 ECTS credits

- *Analyses and principles of analysis at bio-molecular, cell, tissue and organ level*
- *Quality assurance and enhancement*
- *Biomedicine*

Natural and Health Sciences 2 ECTS credits

- *Natural- and health-science research methodology*
- *Medical technology evaluation*
- *Statistics*
- *Chemistry*
- *Biochemistry*
- *Physics*
- *Anatomy*
- *Physiology*
- *Biology*

Social Sciences 1 ECTS credit

- *Theory of science*
- *Social science research methodology*
- *Communications and teamwork*

Theoretical teaching	1 ECTS credit
Clinical training	9 ECTS credits
Total	10 ECTS credits

### **Assessment**

The module culminates in an internal clinical test.

The students' learning outcomes are assessed according to the 7-point grading scale.

## 4.14 Module 14 – Professional Bachelor Project

### Theme

The module consists of a final exam project (the Bachelor Project), which is a self-chosen piece of development work within the field covered by the profession.

### Objectives

The module qualifies students to select, organise and implement a development project in bioanalysis in an independent manner and using an appropriate scientific approach.

### Learning objectives

On successful completion of the module, students will have achieved the following learning objectives:

- knowledge of the key areas of knowledge in bioanalysis, biomedicine, and the health and natural sciences, including existing medical-laboratory examinations and analyses and the quality evaluation and securing thereof, on a level that enables them to independently evaluate and put into perspective this knowledge, e.g. in relation to prophylaxis, diagnostics and treatment
- knowledge of relevant science theory, including understanding of the theories' methodological aspects, enabling them to evaluate independently and put into perspective their own methodological problems
- knowledge of how, independently, to plan, conduct, document and evaluate medical-laboratory examinations and analyses
- knowledge of how to justify selected actions and solutions in relation to their prophylactic, diagnostic and treatment relevance, and in relation to technological, ethical, working environment, patient-related and organisational issues
- knowledge of how to conduct independent quality evaluation and assurance of medical-laboratory studies and analyses, and justify the selected procedures and solutions
- knowledge of how to participate in the development of evaluation and assurance systems for managing medical-laboratory examinations and the quality of analyses
- knowledge of how, independently, to seek out, acquire and critically evaluate new knowledge in relation to the profession and its adjacent areas
- knowledge of how to apply new knowledge, both in the context of practice and as active participants in the research, development, implementation and evaluation of new medical-laboratory examinations and analyses
- knowledge of how to communicate, orally and in writing, the profession's professional and practical problems and solutions using clear terminology
- knowledge of how to work responsibly and professionally, and in a way that incorporates an ethical understanding of the work involving patients and their relatives, during medical-laboratory experiments and in relation to interdisciplinary teamwork with other groups of health professionals
- knowledge of how to reflectively combine bioanalytical skills with knowledge and understanding of professional, ethical, working-environment, patient-related and organisational conditions, and knowledge of how to deploy this competence in the planning, development, implementation, conducting, documentation, and quality-assurance and -control of biomedical analyses
- knowledge of how to identify general and specific bioanalytical problems, analyse and interpret them using relevant theory, and contribute constructively to the development of the profession

- knowledge of how to work with patients, relatives, colleagues and other professionals, irrespective of ethnic, cultural, religious and linguistic background
- knowledge of how to conduct medical-laboratory examinations and analyses
- knowledge of how to further develop their own knowledge, skills and competences and identify their own learning needs
- knowledge of how to promote innovation and apply existing knowledge in new contexts in order to follow, use and participate in research work in the field of biomedicine

### **Allocation of subjects and ECTS credits**

The module is prescribed to 20 ECTS credits covering the core subject areas included in the programme: Biomedical Laboratory Analysis (12 ECTS credits), Natural and Health Sciences (7 ECTS credits), Social Sciences (½ ECTS credit) and Humanities (½ ECTS credit)

Theoretical teaching	15 ECTS credits
Clinical training	5 ECTS credits
Total	20 ECTS credits

### **Assessment**

The module culminates in an external theory test.

The test consists of the Bachelor Project, which consists of a written project and a subsequent individual oral examination, which are weighted equally in the grading. The test is designed to provide an opportunity to evaluate the students' ability to work independently and in a development-oriented manner within the field of bioanalysis. The report must be 20–40 standard pages and structured along the same lines as an academic article. A literature list from areas covered must be attached. It is a requirement that the literature includes original works.

The students' learning outcomes are assessed according to the 7-point grading scale.

## **5 Types of classes and ways of working**

The programme creates the learning conditions for students to develop the professional competences to function independently as biomedical laboratory technologists and to continue on to higher education. These learning processes are organised in such a way that students acquire and develop independence, the ability to work in teams, and the ability to reflect upon and contribute to academic innovation. This is done in interaction with teachers, clinical instructors and fellow students and requires active participation by the students. Recurring features are an exploratory attitude to bioanalysis and its share of and importance to the individual patient's care plan, as well as in relation to other areas of work than the health service. These elements encourage students to reflect on their own knowledge, skills, competences, attitudes and relationships.

Classes are designed to promote academic and pedagogic progression, and provide students with the opportunity to combine clinical experience with theoretical knowledge. The progression is reflected in the modules' learning objectives.

The forms of teaching and work underpin the academic content and the learning objectives set for each module. Variation in the forms of work, the use of relevant media, and practical exercises at the clinical training sites and educational institution help students gain a broader perspective and see the links between the programme's individual subjects and subject areas, as well as between the theory classes and the clinical training. The forms and methods of teaching used seek to promote innovative competences and independence in the learning process. Variation in the types of classes and ways of working accommodate differences in the individual students' learning profiles.

### **5.1 Theory classes**

The learning activities in theory classes are organised so that their form supports both the academic content and the competences that students are expected to develop. The types of classes and ways of working cover a wide range of activities, including:

- lectures, talks, workshops and theme days,
- class-based learning, e.g. student presentations, theoretical exercises and assignments, dialogue-based teaching, problem-based learning, case-based teaching, teaching laboratories and project-based teaching, with variation in the presentation and dissemination of the results and product,
- supervision provided for individual and joint assignments, e.g. projects,
- use of various types of virtual learning,
- reading groups and study circles.

### **5.2 Clinical training**

The clinical training is organised at healthcare sites and/or in areas with corresponding bioanalytical practice. The training is organised in close co-operation between the educational institution and the clinical training site. The aim is to strengthen links between the students' learning in theory and in practice.

During clinical training, students participate in authentic work situations faced by biomedical laboratory technologists, including the analysis and examination of biological material in interaction with competent and experienced technologists and other health professionals.

The clinical training is provided by clinical teachers in collaboration with the educational institution and its teachers.



The planned and targeted training and supervision is based on exemplary bioanalytical analyses and areas of work. An individual study plan is drawn up by the student, the clinical training site and the educational institution.

### **5.3 Information Technology (IT)**

The programme uses IT as a teaching tool and as an object of learning.

As a teaching tool, the integration of IT helps to build up study-relevant competences that broaden the students' opportunities to actively participate, communicate, share knowledge and work with others in a variety of educational contexts. IT is used in classes and in learning processes on an equal footing with other teaching aids, which generally support and develop various forms of interaction.

In relation to the students' current and future requirements for academic development, various IT tools are used to support the development of information competence. IT helps students develop the ability to search for information, and to critically select, evaluate, structure and use information from various relevant sources.

IT as an object for learning is motivated by the fact that the bioanalytical field of practice includes many different IT-based technologies, and also that the electronic ordering of biomedical laboratory analyses and online responses are increasingly common in professional practice. The types of classes and study support the acquisition of relevant IT competences and help students to develop relevant professional IT competences. These competences include:

- awareness of information technology's potential to improve the efficiency and qualification of administrative and health-care processes, in order to optimise resource utilisation in the health system and guarantee coherent patient care
- understanding of information technology's potential applications in quality-assurance work on biomedical laboratory analyses, from requisitioning to analysis and the generation of results, and in the submission of responses.

The use of IT tools during the programme helps to develop students' familiarity with different IT functionalities. The use of IT in the planning, implementation and evaluation of teaching is designed to promote innovation, variation, flexibility and versatility in the types of classes and study.

### **5.4 Academic supervision**

The objective of academic supervision is to take account of different students' academic qualifications and needs so that the programme incorporates varying types of teaching that accommodate the students' learning styles and motivation and support completion of the programme. The academic supervision supports individual students as well as differentiated groups of students via, for example, structured interviews in relation to modules, subjects, methodology, clinical and theoretical training, individual study plans, contact teachers, etc.

Academic supervision is based on the individual student or student group's academic and learning skills and needs, hence the variety in the types of classes and study. The academic supervision supports individual students as well as differentiated groups of students via, for example, structured interviews in relation to modules, subjects, methodology, clinical and theoretical training, individual study plans, contact teachers, etc.

## **5.5 Student guidance**

Student guidance supports students throughout the programme, from initial choice of programme to completion of study. It requires active input from the student adviser, academic supervisor and student.

The objective is to help students to create transparency in their studies and enable them to make informed choices about their own learning and wellbeing. Student guidance also focuses on helping students in connection with:

- study start (the programme's first modules)
- correlation between clinical training, theory classes and learning in different contexts
- study and working habits, time management, maintaining an overview and optimising their study processes.

The objectives are:

- to provide objective information and guidance so that students are able to make independent and informed choices on academic and study-related issues
- to inform and advise in relation to enrolment, study start, completion of studies and career planning.

Guidance is organised by the educational institution as both an individual and a collective service. These two aspects are mutually supportive and complementary.

Guidance covers study techniques, study tools, the study environment and study and working habits. The aim is to increase student awareness of learning, study requirements and completion. This includes helping students develop study skills in both theoretical and clinical learning spaces. This involves planning their own time, choosing learning methods and types of classes, developing learning styles and establishing study groups.

Student advisers and students make active and systematic use of experiences and evaluations/self-evaluations in order to increase the opportunities for learning and quality enhancement in both theory classes and clinical training.

The career-planning aspect is based on the organisation of learning and of the students' programmes, information and guidance on job hunting, continuing and further educational opportunities, changing study programme and international exchange visits.

## **6 Co-operation between the educational institution and clinical training sites**

The educational institution and the clinical training sites work together to develop frameworks and conditions for the students' learning and the relationship between theory and clinical training, in accordance with the knowledge, skills and competences students are required to achieve on the programme.

Agreement has been reached on:

- the procedure for approval of clinical training sites
- the number of clinical training places
- the organisation of the clinical training
- co-operation between students, clinical instructors and teachers from the educational institution

- involvement of students and teachers from the educational institution in development projects during the clinical training, and the involvement of clinical teachers in theoretical teaching
- frameworks and conditions for secondments between the educational institution and the clinical training sites
- procedures for evaluation and quality assurance of the clinical training.

The collaboration is formalised on three levels:

- Between the management of the educational institution and the management at the clinical training sites, in order to discuss, evaluate and further develop the content of the programme and the agreements reached between the educational institution and the clinical training sites
- Between teachers at the educational institution and clinical trainers, with a view to incorporating the latest knowledge of key trends in business, research and the profession into training and development projects
- Between students, clinical trainers and teachers from the educational institution, in order to co-ordinate the individual student's clinical training and assessment, in the form of drawing up the individual study plan.

## **7 Criteria for approval of clinical training sites**

A clinical training site is a strictly defined and separately managed institution in the health area, or an equivalent area that carries out bioanalysis work, which the educational institution has approved as a training site for its biomedical laboratory technologist students.

The clinical training site is responsible for the frameworks and conditions with which an approved site has to comply.

It is also responsible for ensuring that an account exists of how the students' evaluations of the clinical training are used in the ongoing process of quality enhancement.

To be approved, a site must draw up a basis for approval of its training for specific modules.

A precondition for approval is that the clinical trainers are biomedical laboratory technologists and have pedagogic qualifications equivalent to 1/6 of a diploma programme or 9 ECTS credits.

The clinical trainer is in charge of and responsible for the day-to-day clinical training and supervision of the students at the approved site.

The site must devote resources to the clinical training and supervision.

The basis for approval of sites includes a description of their organisation and management, the conditions for professional bioanalysis and the educational conditions, as follows:

### Organisation and management

The site's bioanalytical, educational and organisational basis, frameworks and conditions, including an account of the trainers' academic and pedagogical qualifications and competences.

### Conditions for professional bioanalysis

The bioanalysis, interdisciplinary and intersectoral conditions, including the assignments, phenomena and processes that form the academic basis for students being able to develop the qualifications described in the curriculum.

### Educational conditions

The clinical training's organisation and arrangement, including study methods and conditions for the students' participation in the clinical training.

The clinical trainers' function, including the use of resources and forms of collaboration between trainers and students.

The learning and study environment, including teaching facilities that support the students' academic and personal learning processes in relation to the modules' learning objectives.

Approval of a clinical training site is valid for three years, with a notice period of one year. Approval is given in writing.

In exceptional circumstances, approval can be granted conditionally, with a view to the site meeting the approval requirements within a defined period of time.

If changes occur during the approval period that have significant consequences for the students' clinical training and the reception of new students, the site must inform the educational institution as soon as possible.

## **8 Study plans**

A module's clinical training and assessment are arranged on the basis of the module description and a general study plan that describes the clinical training at the specific site.

Based on the general study plan, an individual plan is drawn up by the educational institution in collaboration with the student and the clinical training site.

The individual study plan includes agreements on the student's attendance, dates for the training and supervision, the content and form of the training, study activities, including submission of and feedback on assignments, etc., as well as deadlines for evaluation and assessment.

The educational institution prepares the students for their clinical training, and this practical experience is subsequently incorporated into the theory classes.

## 9 International educational opportunities

The programme includes international educational opportunities, the aim of which is to train students to contribute to professional bioanalysis in a globalised world.

The programme therefore aims to provide students with academic knowledge at international level, as well as intercultural and international competences, including knowledge of and respect for other cultures, as well as the ability to reflect upon their own cultural values and to understand how these influence bioanalysis.

Internationalisation is included in the day-to-day education on health programmes throughout Denmark as well as at an institution abroad that has been approved by the educational institution concerned.

Students have the opportunity to take some of their theory classes and clinical training abroad. The educational institution may, if conditions warrant, allow credit transfers in advance.

Each educational institution has entered into agreements with institutions abroad about student exchanges. These agreements, including details of the application and approval procedure and opportunities for financial assistance, are described on the individual institutions' websites.

## 10 Tests and assessments

An assessment is made at the end of each module. It takes the form of either an external or an internal test.

External tests are assessed by internal and external examiners. External examiners are appointed by the Ministry of Education.

Internal examinations are assessed by at least one internal examiner from the educational institution.

Each institution may set rules for test conditions per individual module that apply only to the institution concerned. Test conditions are defined as the submission of assignments, projects, etc., as well as attendance criteria for theory classes and clinical training.

For clinical training, it is also a prerequisite that the students document the study activities described in their individual clinical study plans.

### 10.1 List of assessments during the programme

The programme is prescribed to 210 ECTS credits, as per the table below.

Module	External test		Internal test	
	Clinical training ECTS credits	Theory ECTS credits	Clinical training ECTS credits	Theory ECTS credits
1			7½	7½
2			0	15
3			0	15
4	12	3		
5			3	12

6	4½	10½		
7	6	9		
8			0	15
9			0	15
10	6	9		
11			13	2
12			9	6
13			9	1
14	5	15		
Subtotal	33½	46½	41½	88½
Total	80		130	

External tests are held in modules 4, 6, 7, 10 and 14

The other modules are assessed by internal tests.

The clinical test in module 1 is assessed Pass/Fail.

The other tests are assessed according to the 7-point grading scale.

## 10.2 Guidelines for assessments

Students may register for the same test three times. Students are not allowed to resit tests that they have passed.

Registration for a module includes automatic registration for the examination in the module concerned. Unless the student withdraws by the published deadline, the test is considered to have commenced and counts towards the number of attempts. Withdrawal is permitted until the beginning of the test, unless stipulated otherwise by the institution.

Failure to meet any of the test conditions set by the institution in the local supplement to the curriculum will be considered to constitute automatic withdrawal from the module.

Tests are taken in Danish. Where a request is submitted and conditions permit, the educational institution may also allow an examinee to take a test in a foreign language.

Before the end of semester 2, students register for test(s) to be taken before the end of the semester. To continue on the programme, students must pass these test(s) before the end of semester 4.

For Bachelor Projects written in Danish, in addition to the academic content, the assessment also places weight on the examinee's ability to write and spell. However, the academic content is weighted heaviest.

The external and internal tests in years 1–3 of the programme must be passed before the Bachelor Project is completed.

Rules for make-up exams are the same as for the original exam.

Exam rules that apply only to the individual institution are published in the local supplement to the curriculum.

### **10.3 Special test conditions**

Under the Act on Special Educational Assistance in Higher Education, students who meet certain criteria may be offered special test conditions.

## **11 Compulsory participation**

In order to achieve the described learning objectives, students participate in planned and targeted training and supervision in the modules' themes and key areas.

The institution's local supplement to the curriculum indicates which modules have compulsory attendance for theory classes. It also stipulates the requirement for the documentation of compulsory attendance for theory classes.

Student participation in clinical training averages approx. 30 hours per week. The clinical trainer certifies that students meet the participation requirement. The certification is a prerequisite for the student being registered for the clinical test in the module concerned.

## **12 Credit(s)**

It is possible to obtain credits from parts of the programme on the basis of previously acquired qualifications. Credits are granted on the basis of documented training or employment commensurate with the part of the programme for which credit is sought.

Credits are based on the institution's evaluation of the extent to which previously completed courses correspond to the theoretical parts of the programme, and on whether the qualifications acquired through employment correspond to the objectives set for the clinical part of the programme.

Documentation of completed training must consist of formal test and examination certificates, as well as course and degree certificates. In relation to employment, documentation generally consists of proof of employment, testimonials, etc.

Credits obtained will reduce the time taken to complete the programme or grant exemption from parts of it. Decisions about credits are made by the educational institution.

## **13 Exemption**

In exceptional circumstances, the educational institution may grant exemptions from the local supplement to the curriculum.