Assessment plan
Master's degree programme Applied Physics
2022-2023

June 2022

Introduction

This assessment plan is a systematic description of the type of assessment used in the various modules of the Master's programme Physics. This assessment plan fits within the assessment policy of the Faculty of Science and Engineering [1], and the protocol used by the Board of Examiners of the degree programme [2].

The assessment plan is based on:

- the learning outcomes of the degree programme (appendix 1);
- the Teaching and Examination regulations of the degree programme;
- the description of the various modules of the degree programme in the digital course catalogue *Ocasys*, including:
    - Objective of the module;
    - Course content;
    - Lecturers and examiners;
    - Assessment method used;
    - Lecture format.

Assessment plan 2022-2023
The assessment plan contains two parts:

1. An overview of examiners and assessment methods used for all modules in the Applied Physics Master's programme. The following assessment methods are distinguished in this scheme:
    - Written examination (WE);
    - Oral examination (OR);
    - Assignment, including homework and written report (AST);
    - Assessment of Practical work, including laboratory and computer work (PR);
    - Presentation (P);
    - Midterm test (IT).

    In case of just one examiner, a deputy examiner [3] is given. The coordinator of the module is underlined, in case more examiners are involved in teaching.

2. A matrix describes the relation between the various modules of the programme and the specified learning outcomes of the degree programme. The specified learning outcomes are defined in the programme's Teaching and Examination Regulation and have been included in appendix 1.

[1] FSE Quality Assurance Manual 2016-2017; chapter 6: Assessment policy

[2] FSE Manual for Board of Examiners (version: 2019); Chapter 4: Duties of the Board of Examiners

[3] FSE Quality Assurance Manual 2016-2017; paragraph 6.3: Practical matters

Examiners and assessment methods of modules in the degree programme

Applied Physics (core programme)

Module	First examiner	Assessment method	Second examiner and other teachers
Characterisation of Materials (WMPH021-05)	G.R. Blake	WE	W. Roos, B.J. Kooi
Computational Physics (WMPH007-05)	P.R. Onck	AST	E. van der Giessen
Cross-disciplinary Materials Science (WMPH049-05)	M. Lerch	AST, P	W.R. Browne
Properties of Functional Materials (WMPH051-05)	G.R. Blake	WE	C.H. van der Wal
Mechanical Properties (WMPH023-05)	E. van der Giessen	AST	B.J. Kooi
Mesoscopic Physics (WMPH037-05)	B.J. van Wees	AST, WE, P	T. Banerjee
Physics with Industry (WMPH041-05)	R.A. Hoekstra	AST, WE, P	P.R. Onck
Structure at Macro, Meso and Nano Scale (WMPH020-05)	L. Protesescu	AST, WE	B.J. Kooi, B. Noheda Pinuaga,
Industrial Research (WMPH003-20)	*See list examiners research projects below*	AST, PR, P	
Applied Physics Research (WMPH901-40)	*See list examiners research projects below*	AST, PR, P	

Applied Physics (Optional courses in science and engineering)

Module	First examiner	Assessment method	Second examiner and other teachers
Bioinspired Designer Materials (WMCH009-05)	M.M.G. Kamperman	WE, P	G. Portale
Memristive Devices (WMPH043-05)	B. Noheda Pinuaga	AST, WE	T. Banerjee
Multibody and Non-Linear Dynamics (WMME009-05)	A.O. Krushynska	AST, WE, P	*TBD*
Neuromorphic Circuit Design (WMPH044-05)	E. Chicca	AST, WE	B. Noheda Pinuaga
Optoelectric Devices (WMPH042-05)	M.A. Loi	WE	L.J.A. Koster
Physics of Lasers (WMPH027-05)	R. Hildner	WE/OR	R.A. Hoekstra
Polymer Physics	G. Portale	WE, P, PR	K. Loos
Robotics for IEM (WMIE005-05)	M. Cao	AST, WE	B. Jayawardhana
Smart Materials for Engineering (WMME021-05)	M.I. Acuautla-Meneses	WE, P, PR	B.J. Kooi
Surface Interactions in Electromechanical Systems (WMPH045-05)	G. Palasantzas	AST, WE	H. Waalkens
Surfaces and Interfaces (WMPH014-05)	A. Grubisic-Cabo	WE	P. Rudolf
Theoretical Condensed Matter Physics (WMPH031-05)	M.V. Mostovoy	AST, WE	T. La Cour Jansen
Ultrafast Time-Resolved Spectroscopy (WMPH040-05)	M.S. Pchenitchnikov	AST, PR, WE	T. La Cour Jansen

Examiners for Master's Research Projects

Banerjee, prof. dr. T.
Bari, prof.dr. S.
Chicca, prof.dr. E.
Diniz Guimaraes, dr. M.H.
Ehrler, dr. B.
Giessen, prof.dr.ir. E. van der
Giuntoli, dr. A.
Hoekstra, prof.dr.ir. R.A.
Kooi, prof.dr.ir. B.J.
Koster, prof.dr. J.A.
Krushynska, dr. A.O.
Loi, prof.dr. M.A.
Maresco, dr. F.
Noheda Pinuaga, prof.dr. B.
Ocelik, ing.dr. V.
Onck, prof.dr.ir. P.R.
Palasantzas, prof.dr. G.
Protescu, dr. L.
Rudolf, prof.dr. P.
Stamhuis, prof.dr. E.J.
Wal, prof.dr.ir. C.H. van der
Wees, prof.dr.ir. B.J. van
Ye, prof.dr. J.

An examiner for the Master Research projects of Physics may act as second supervisor for a Master Research Project.

Relation between the learning outcomes and the curriculum

The following tables show for each of the specializations how the individual course units contribute to the final qualifications of the programme.

'+' indicates that a course unit contributes to the qualification under consideration.
'*' indicates that the contribution depends on individual choices of the student (only applicable for optional courses and individual research projects).

The numbers in the table heading correspond to the qualifications that are listed in Appendix I.

Applied Physics

Learning outcomes	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	2.6	2.7	3.1	3.2	3.3	4.1	5.1	5.2
Characterization of Materials	+		+	+						+							+	
Computational physics	+	+					+	+		+						+		
Cross-disciplinary Materials Science	+			+									+			+	+	
Properties of Functional Materials	+			+					+								+	+
Mechanical Properties	+		+	+												+	+	
Mesoscopic Physics	+			+					+									+
Physics with Industry	+	+	+	+	+			+	+				+	+	+		+	
Structure at Macro, Micro and Nano Scale	+			+													+	
Optional courses in Science and Engineering	+	+	*	*			*	*	*	*	*	*	*	*	*	*	*	*
Internship in Industry	*	+	*		*	+	+	+	*	+	+	+	*	*	*	+	+	*
Applied Physics Research	+	+	+	+		+	+	+	+	+	+	*	+	+	+	+	+	+

Appendix I Teaching outcomes of the degree programme

The master graduate in Applied Physics:

1. **Knowledge and understanding**
   - 1.1. understands the advanced concepts of physics, including the necessary mathematics and computer science, at a level which permits admission to a PhD programme;
   - 1.2. is familiar with the advanced quantitative character of physics and with the relevant research methods;
   - 1.3. has operational knowledge and design skills in the field of applied physics;
   - 1.4. has a thorough understanding of the current state of the art in materials science, more specifically of structure, functional properties and characterisation of advanced materials;
   - 1.5. has basic knowledge in the present field of business and management;

2. **Application of knowledge and understanding**
   - 2.1. is capable of carrying out research, aimed at understanding of physical phenomena that are potentially usable in applications, or is capable of developing applications of physical phenomena;
   - 2.2. is capable of analyzing a (new) complex applied problem, and to use modelling skills to develop a structured and well-planned research approach;
   - 2.3. is capable of applying his/her specific knowledge and mathematical, experimental, and computer skills to solve physical problems in his/her own and related subject areas and fields;
   - 2.4. has developed an attitude aimed at seeking new applications;
   - 2.5. has experience with the use of complicated apparatus and/or with the use of advanced programming tools;
   - 2.6. has experience in application of applied physics in an industrial environment or in an applied physics research environment abroad;
   - 2.7. is capable to of collaborate in a (multi-disciplinary) research and design team;

3. **Judgement**
   - 3.1. is capable of obtaining relevant information using modern information channels, and to interpret this information critically;
   - 3.2. is capable of managing and judging his/her and others' actions within a highly scientific and professional context, taking societal and ethical aspects into account;
   - 3.3. is able to draw conclusions on the basis of limited or incomplete information, and is able to realize and formulate the limitations of such conclusions;

4. **Communication skills**
   - 4.1. is capable of communicating clearly in English, both verbally and in writing, on his/her subject and relevant applications, at a level which is understandable to experts and non-experts, and using modern communication tools;

5. **Learning skills**
   - 5.1. is capable of addressing issues inside as well as outside his/her main subject area, therefore and thereby gaining new knowledge and skills;
   - 5.2. is able to recognize potential applications of recent advances in physics.