

PGS – specialization Plasma Physics

Responsibilities of a Ph.D. student

The student's duties include:

- submission and defense of the dissertation (submitting the thesis and registering for the defense is expected by the 8th semester)
- passing the doctoral state exam in plasma physics (expected by 4th semester)
- publication of at least two papers in professional journals. The student is the first author in at least one paper. At least one of the papers is published in a Q1 or Q2 journal.
- lecture in English at a professional symposium (by the 8th semester)
- at least a one-month stay abroad
- teaching assistance (4 semesters. The teaching is organized by the pedagogical deputy director.)
- active participation in ÚFE seminars (own lecture by the 6th semester)
- obtaining at least 240 credits (see following tables)

Courses

Mandatory courses:

code	name	credits	typical semester	credits/sem.
XD100	Preparation of the thesis	160	1–8	approx. 20
F6710	Seminar of DPE	12	1–8	2
FC154	Individual literature study 1	4	2	4
FB153	Individual literature study 2	4	3	4
XD102	Teaching assistance	16	2–6	4
XD106	Lecture in the foreign language	6		6
XD110	Placement abroad			depends on length

(FB310 or FC310 can be recognized instead of XD100. FB300 or FC300 can be recognized instead of XD102. FB330 or FC330 can be recognized instead of XD106.)

The student does not have to complete the subject F6710 6-times, if a long stay abroad or if an early submission of the thesis prevents him from doing so. Even in this case, the presentation of own results at the DPE seminary is mandatory. Courses XD100, F6710 and XD102 can be enrolled more times (and earned more credits for them) than indicated in the table.)

Mandatory elective courses: (at least one of the following three courses, enrolled in the first semester)

code	name	credits
FB501	Plasma diagnostics and simulation	3
FB502	Deposition and analysis of thin films	3
FB503	Surface modifications and plasma applications	3

Recommended courses:

code	name	credits
<i>Autumn semester:</i>		
FB010	Elementary processes in plasma 2	3+1
FB100	Plasma Chemical Processes	2
FB240	Physics of high-frequency discharges	2
FB241	Physics of DC, pulsed and low-frequency discharges	2
FB242	Gas discharges: physical mechanisms and applications	2
F7900	Students seminary	1
<i>Spring Semester:</i>		
FC020	Numerical methods in plasma physics	3+1
FB041	Seminar on plasma deposition and material characterization	1
FC051	Plasma diagnostics seminar	1
FC250	Plasma and Dry Nano/Microtechnology	3+1
FC510	Special topics in nanotechnology science	1+1

State exam

The state exam composes of three parts. The first part is focused to the topic of the thesis. The student prepares a short (5–8 min) presentation with the "state of art" (short introduction to the topic, the world-situation in the field, motivation) and with the description of plans and methods that will be used in the dissertation. The presentation is followed by a discussion of the committee with the student on the topic of the thesis.

In the remaining two parts, the student is examined from various fields of plasma physics. The committee will give two questions to the student approx. 1 hour before the exam, the student has this time for preparation without literature. Questions may cover the following topics:

- Kinetic theory of plasma, collisional processes in plasma, transport equations
- Discharges of various types, mechanisms of discharge ignition, discharge structure, processes in discharges
- Plasma-surface interactions, physical and chemical processes on surfaces. Deposition, etching, plasma treatment of surfaces. Surface characterization.
- Plasma diagnostics (UV/VIS emission, absorption, fluorescence. IR, MW, EPR, titration. Scattering of electromagnetic radiation. Probe diagnostics, electric discharge characterization. Mass and energy analysis. Gas chromatography. Schlieren imaging.)
- Plasma applications (creation of materials on surfaces or in the volume, decomposition, source of radiation, use in analytical chemistry, etching, surface modifications, nuclear fusion)

The student has to register in advance for the state exam. The registration can be realized in the IS via: <https://is.muni.cz/auth/uradovna/ukon> – Creating a new records by an authorized user – PíF ODSKAZINT: Application for Doctoral State Examination.

Thesis defense

Before the defense, the student is expected to publish the results of his/her dissertation in at least two papers in impacted journals, of which at least one journal is in the first or in the second quartile. The student is the first author in at least one of the papers. In the case of a higher number of papers (at least five papers in impacted journals, the student is the first author in at least two papers) the work can

be written in the form of a compilation. The compilation must include an in-depth commentary on the candidate's work and a clear description which part of the published work was done by the candidate.

The defense of the dissertation begins with the student's presentation, for which he has 30 minutes. It is expected that, in addition to his/her own results, which form the core of the presentation, the student will introduce the audience to the topic, to the state of the art and to the motivation of his/her work. The presentation is followed by a summary of the reviews, the student's answers to questions in the reviews and to the questions of the committee.

The student has to register in advance for the defense in the IS.

Motivation program

Publications

Currently (year 2023) DPE provides rewards to its Ph.D. students for publications in quality (Q1, Q2) journals. This reward consists of an extra scholarship, which is only given to students who are not employees of MU at the same time (their employment corresponds to a maximum of half-time job), and possible support for participation in the conference (up to CZK 30,000), if the student is the first author of the publication.

The amount of the scholarship depends on the number of authors - rewarded students of the DPE and their order according to the table:

	1 st student	2 nd student	3 rd student	student is the 1 st author
1 student	22 500			7 500 CZK
2 students	15 000	7 500		+ a conference
3 students	13 500	6 000	3 000	(up to CZK 30,000)

If the student has more affiliations in the paper, he/she will get only the corresponding part of the scholarship and of the eventual contribution for the conference.

State exam

Furthermore, the DPE currently provides a reward for a good (grade A – C) and on time (by the sixth semester) completed state exam, according to the following table:

semester (student studied Mgr. specialization in plasma physics):	1 – 3	4	5	6
semester (student from elsewhere):	1 – 5		6	
A	24 000	18 000	12 000	6 000
B	16 000	12 000	8 000	4 000
C	8 000	6 000	4 000	2 000
D	0	0	0	0
E	0	0	0	0
F	0	0	0	0