Curriculum Structure of the Program of the PhD in Chemistry

1. Guidelines

The basic study plan is shown in Section 2. The minimum number of the credit hours required for this program is 42 hours, comprising 21 credit hours for seven graded courses and 21 hours for the dissertation. In total, the program requires a minimum of 72 contact hours, which include participation in 28 non-credited courses with a total of 30 contact, the seven credited courses, and the dissertation component.

To clearly outline the program requirements, both credit and contact hours can be categorized into the following four main components:

1. **Component 1**: Completion of elective specialization courses totaling 21 credit hours.
2. **Component 2**: Attendance of 28 non-credit courses, with a total of 30 contact hours.
3. **Component 3**: Submission of a dissertation worth 21 credit hours, along with at least one publication.
4. **Component 4**: Successful completion of the comprehensive examinations.

Of all the requirements, only the seven graded courses are included in the calculation of the student's GPA. For the additional contact hours (non-credit courses), a minimum score of 70 out of 100 is required for satisfactory completion.

In summary, the program comprises a total of 42 credit hours (21 for coursework and 21 for the dissertation) and 72 contact hours.

The 21 credit hours are represented by seven courses (see Section 3), which are assigned to students based on the chemistry specialization of their dissertation—i.e., organic chemistry (see Section 3.1), inorganic chemistry (see Section 3.2), physical chemistry (see Section 3.3), or analytical chemistry (see Section 3.4). Of these seven courses, four are drawn from the student's chosen specialization, while the remaining three are selected from the other specializations.

For courses with additional contact hours, 26 non-credit courses are distributed across six levels, as outlined in the basic study plan (see Section 2). Additionally, two applied non-credited courses (see Section 4) are assigned based on the thesis topic.

The comprehensive examination consists of two parts: written and oral. A student may not register for the dissertation until both parts of the exam are passed. During the second year of the program, each student must take eight exams and pass at least four of them with a minimum score of 70 out of 100. The written exams are aligned with the dissertation specialization—four exams from the student's specialization and one exam from each of the remaining three specializations.

If a student did not take courses in the four classical chemistry specializations—organic, inorganic, physical, and analytical—during their master's program, complementary courses (see Section 5) will be assigned during the first year of the PhD. Depending on prior coursework, a student may be assigned zero to four complementary courses.

2. Basic Study Plan

First Year/First Level				
Course code	**Course title**	**Required/Elective**	**Credit H**	**Contact H**
7000CHEM	Laboratory Safety	R	0	1
7001CHEM	Ethics of Scientific Research	R	0	1
7003CHEM	Chemistry Literature	R	0	1
7004CHEM	Research Rotation 1	R	0	3
7008CHEM	Chemistry Teaching	R	0	1
****CHEM	Elective Specialization Course 1	E	3	3
****CHEM	Elective Specialization Course 2	E	3	3

First Year/Second Level				
Course code	**Course title**	**Required/Elective**	**Credit H**	**Contact H**
7005CHEM	Research Rotation 2	R	0	3
7501CHEM	Departmental Seminar 1	R	0	1
7511CHEM	Major Field Seminar 1	R	0	1
****CHEM	Elective Specialization Course 3	E	3	3
****CHEM	Elective Specialization Course 4	E	3	3

Second Year/Third Level				
Course code	**Course title**	**Required/Elective**	**Credit H**	**Contact H**
7006CHEM	Advanced Scientific Communication	R	0	1
7506CHEM	Departmental Seminar 2	R	0	1
7512CHEM	Major Field Seminar 2	R	0	1
7521CHEM	Research Group Seminar 1	R	0	1
7601CHEM	Pre-Dissertation Research 1	R	0	3
****CHEM	Elective Specialization Course 5	E	3	3
****CHEM	Elective Specialization Course 6	E	3	3

Second Year/Forth Level				
Course code	**Course title**	**Required/Elective**	**Credit H**	**Contact H**
7007CHEM	Original Research Proposal	R	0	1
7507CHEM	Departmental Seminar 3	R	0	1
7513CHEM	Major Field Seminar 3	R	0	1
7522CHEM	Research Group Seminar 2	R	0	1
7531CHEM	Graduation Research Seminar 1	R	0	1
7602CHEM	Pre-Dissertation Research 2	R	0	3
7600CHEM	Ph.D. Dissertation	R	21	21
****CHEM	Elective Specialization Course 7	E	3	3

Third Year/Fifth Level				
Course code	**Course title**	**Required/Elective**	**Credit H**	**Contact H**
7508CHEM	Departmental Seminar 4	R	0	1
7514CHEM	Major Field Seminar 4	R	0	1
7523CHEM	Research Group Seminar 3	R	0	1
7532CHEM	Graduation Research Seminar 2	R	0	1
****CHEM	Applied Course 1	E	0	3

Third Year/Sixth Level				
Course code	**Course title**	**Required/Elective**	**Credit H**	**Contact H**
7505CHEM	Departmental Seminar 5	R	0	1
7515CHEM	Major Field Seminar 5	R	0	1
7524CHEM	Research Group Seminar 4	R	0	1
****CHEM	Applied Course 2	E	0	3

3. Elective Specialization Courses

3.1. Elective Specialization Courses in Organic Chemistry

Course code	Course title	Required/ Elective	Credit H	Contact H
7101CHEM	Physical Organic Chemistry	E	3	3
7102CHEM	Spectroscopic Organic Structure Determination	E	3	3
7103CHEM	Advanced Organic Chemistry I	E	3	3
7104CHEM	Advanced Organic Chemistry II	E	3	3
7105CHEM	Advanced Synthesis in Chemistry	E	3	3
7106CHEM	Selected Topics in Organic Chemistry	E	3	3

3.2. Elective Specialization Courses in Inorganic Chemistry

Course code	Course title	Required/ Elective	Credit H	Contact H
7201CHEM	Advanced Inorganic Chemistry I	E	3	3
7202CHEM	Advanced Inorganic Chemistry II	E	3	3
7203CHEM	Inorganic Chemistry Synthesis	E	3	3
7204CHEM	Advanced Radiation and Nuclear Chemistry	E	3	3
7205CHEM	Advanced Applications in Group Theory	E	3	3
7206CHEM	Selected Topics in Inorganic Chemistry	E	3	3

3.3.3. Elective Specialization Courses in Physical Chemistry

Course code	Course title	Required/ Elective	Credit H	Contact H
7301CHEM	Quantum, Structure and Dynamics I	E	3	3
7302CHEM	Chemical Thermodynamics	E	3	3
7303CHEM	Chemical Kinetics and Reaction Dynamics	E	3	3
7304CHEM	Statistical Thermodynamics	E	3	3
7305CHEM	Quantum, Structure and Dynamics II	E	3	3
7306CHEM	Selected Topics in Physical Chemistry	E	3	3

3.4. Elective Specialization Courses in Analytical Chemistry

Course code	Course title	Required/ Elective	Credit H	Contact H
7401CHEM	Separation Techniques	E	3	3
7402CHEM	Spectroscopic Analytical Techniques	E	3	3
7403CHEM	Environmental Analytical Chemistry	E	3	3
7404CHEM	Advanced Electroanalytical Chemistry	E	3	3
7405CHEM	Bioanalytical Chemistry	E	3	3
7406CHEM	Selected Topics in Analytical Chemistry	E	3	3

4. Applied Courses

Course code	Course title	Required/ Elective	Credit H	Contact H
7008CHEM	Applied Physical Methods of Inorganic Chemistry	E	0	3
7009CHEM	Applied Separation Techniques	E	0	3
7010CHEM	Applied NMR Techniques	E	0	3
7011CHEM	Applied Statistical and Data Analyses	E	0	3
7012CHEM	Applied Physical Methods in Material Chemistry	E	0	3
7013CHEM	Applied Mathematics in Physical Chemistry	E	0	3
7014CHEM	Applied X-Ray Structure Determination	E	0	3
7015CHEM	Applied Mass Spectroscopy	E	0	3
7016CHEM	Applied Spectroscopic Methods of Structure Determination	E	0	3
7017CHEM	Applied Quantitative Methods of Computational Chemistry	E	0	3

5. Complementary Courses

Course code	Course title	Required/ Elective	Credit H	Contact H
7100CHEM	Special Topics in Organic Chemistry	E	0	3
7200CHEM	Special Topics in Inorganic Chemistry	E	0	3
7300CHEM	Special Topics in Physical Chemistry	E	0	3
7400CHEM	Special Topics in Analytical Chemistry	E	0	3