

Appendix
Double Degree Agreement on Master's level in Chemistry between
Justus Liebig University Giessen, Germany,
Faculty of Biology and Chemistry
and
UNIVERSITY OF PADOVA, Italy,
Department of Chemical Sciences

1. Aims:

Based on the agreement of Justus Liebig University (JLU) and Padua University (UNIPD) both universities establish a double degree programme on Master's level in Chemistry. The programme provides the opportunity for master students of Chemistry at JLU and for master students of Chemistry of the Department of Chemical Sciences at UNIPD to gain the Master's degree of both universities: the „Master of Science“ of JLU and the „Master of Science“ of UNIPD.

2. Master's programmes:

The double degree programme is based on the following two Master's programmes, in case of changes to any of these programmes (i.e. due to reaccreditation) both parties agree to inform each other in time and – if necessary – adapt this appendix to the changes:

The **JLU Master's programme in Chemistry** is a 2 years long programme (i.e., 4 semesters) starting normally in October each year (winter semester). The first year includes 6 core modules: one module from each of Inorganic Chemistry, Physical Chemistry, Organic Chemistry, Catalytic Chemistry, Molecular Analysis and Analytics of solids as well as 4 elective modules (lecture-based modules). The second year is entirely devoted to research work. Students choose 3 research modules (2 for in-depth research and 1 for specialisation). The Masters' programme will be completed by submitting the Master's thesis and defending its results in front of an examination committee.

On successful completion of the programme, the faculty confers the award of „Master of Science“ (M.Sc.). Students receive a Master's certificate and a Certificate of Examination including Master's classification¹ and Diploma Supplement (titles of all modules passed, workload and grading as well as the title of Master's thesis and grading are included in these documents).

¹ The M.Sc. award is classified according to an overall grading. The 6 core modules of the first year and the Master's thesis will be count towards the overall grade. The overall grade is calculated by summarizing the weighted grade points of these modules (grade points of each module multiplied by a specific weighting factor). The weighting factor for the 6 first year's modules is 1/9, and the weighting factor for the Master's thesis is 3/9.

The Masters' programme itself is structured in modules. Modules are units of lectures, practical work, seminars, tutorials etc. dedicated to a specified topic (e.g. bioanalytics, solid state theory). Each module is described in detail by its content, aims, workload, types of exams, responsible lecturer etc. and is listed in the "Module descriptions" attached to the Special Regulation for the Master's programme in Chemistry. Every module of the Master's programme in chemistry is graded by grade points (see: grading scheme).

In general, there are two different types of **modules**:

- **Lecture-based modules:** These modules typically include a lecture (running for 15 weeks = 1 semester) and a seminar or a theoretical/practical exercise run by tutors. Thus, these modules can typically be finished completely within 4-5 months. Marks will be given on the basis of either a written or oral exam at the end of the module. The first year includes as described above.
- **Research modules:** These modules are exclusively research-based, and the modules are defined on an individual basis – depending on the research profile of the respective master student. The student can either take part in ongoing research or can be trained in a specific scientific method. Students select three research modules during the second year (semester 3): 2 in-depth research modules and one specialisation research module (for preparing their Master thesis (10 CP each)).

In accordance with the European Credit Transfer System (ECTS), the volume of learning activities (workload) required for achieving the Master's degree in Chemistry equals 120 CP (ECTS Credit Points), i.e. 30 CP per semester / 60 CP per year. 1 CP is equivalent to an average working time of 30 hours. This includes contact time at which students have to be present at lectures, seminars, tutorials, practical work etc. and time for preparation and post-processing. Finally, this also includes time for self-study and examinations.

Each first year lecture-based module comprises 6 CP corresponding to 180 hours working time. The second year research modules comprise 10 CP each (i.e. 300 h). Preparing and defending the Master's thesis is equivalent to 30 CP (i.e. 900 h / 22 weeks).

JLU M.Sc. Chemistry Schedule:

Master of Science Chemistry					
2. Year	WiSe/SoSe	Master Thesis (30 CP)			
	WiSe/SoSe	In-depth research module I (10 CP)	In-depth research module II (10 CP)	Specialisation research module (10 CP)	
1. Year	SoSe	Solid State and Materials chemistry (6 CP)	Organic Chemistry 4 (6 CP)	Methods 2: Analytics of Solids (6 CP)	Elective Module 3 (6 CP)
	WiSe	Molecular Catalysis (6 CP)	Methods 1: Molecular Analytics (6 CP)	Physical Chemistry 4 (6 CP)	Elective Module 1 (6 CP)
				Elective Module 4 (6 CP)	Elective Module 2 (6 CP)

The **UNIPD Master's programme in Chemistry** provides training in the advanced methods and techniques of modern chemistry. Students broaden their knowledge through core contents and a selection of courses allowing them to tailor the program to meet their personal interests. A systematic approach to devising experiments is developed and a broad range of synthetic, analytical, spectroscopic and computational techniques is explored. Finally, the methods and techniques of scientific research in a particular area of chemistry are introduced by undertaking an intensive novel research project.²

M.Sc. Chemistry Schedule:

Both Normal and Double Degree Programmes share the first two semesters:

I semester (October, 1 – Last Week of January)			
Course Name	ECTS	Type	Language
Inorganic Chemistry III	10 (6C+1E+3L)	Core	IT
Organic Chemistry IV	10 (6C+1E+3L)	Core	IT
Physical Chemistry IV	10 (8C+1E+1L)	Core	EN
II semester (March, 1 – Second Week of June)			
Course Name	ECTS	Type	Language
Analytical Chemistry of the Environment	6C	Core	IT
Advanced Inorganic Chemistry Bioinorganic Chemistry Chemistry of Inorganic Materials Inorganic Reaction Mechanisms Crystallography & Biocrystallography	6C	Optional 1 (IC)	IT
Chemistry of Organic Materials Advanced Organic Chemistry Supramolecular Chemistry Organic Synthesis & Reactivity Crystallography & Biocrystallography	6C	Optional 2 (OC)	IT/EN
Physical Chemistry of Biological Systems Solid State & Materials Physical Chemistry Theoretical Chemistry Optical Properties of Molecular Systems Magnetic Spectroscopies Crystallography & Biocrystallography	6C	Optional 3 (PC)	IT/EN
Any of the above	6C	Optional 4	IT/EN

C - Classroom teaching (1 ECTS = 8 hours); E - Exercises (1 ECTS = 10 hours); L - Laboratory (1 ECTS = 12 hours)

Normal Programme

III semester			
Course Name	ECTS	Type	Language
Analytical Chemistry of Pollutants Bio-organic Physical Chemistry Protein Structure and Dynamics Physical Methods in Organic Chemistry Surface Chemistry and Catalysis	6C	Free Choice 1	IT/EN

² Course Syllabus: <http://en.didattica.unipd.it/offerta/2015/SC/SC1169/2015>.

Principles and Applications of Metalorganic Chemistry Electrochemistry Magneto chemistry			
Any of the above, or courses offered by other MDs (subject to approval)- in particular: Biopolymers (Industrial Chemistry) Optics of Materials (Materials Science) Nanofabrication (Materials Science)	6C	Free Choice 2	IT/EN
Patents, Regulations and Products Development (PPD)	3E	Core	IT
Educational Internship (initial part of thesis internship)	5L	Core	IT/EN
Master Thesis internship (beginning)	10L	Core	IT/EN
IV semester			
Course Name	ECTS	Type	Language
Master thesis internship (end)	30L	Core	IT/EN

Double Degree Programme

III semester			
Course Name	ECTS	Type	Language
Analytical Chemistry of Pollutants Bio-organic Physical Chemistry Protein Structure and Dynamics Physical Methods in Organic Chemistry Surface Chemistry and Catalysis Principles and Applications of Metalorganic Chemistry Electrochemistry Magneto chemistry	6C	Free Choice 1	IT*/EN
Any of the above, or courses offered by other MDs (subject to approval)- in particular: Biopolymers (Industrial Chemistry) Optics of Materials (Materials Science) Nanofabrication (Materials Science)	6C	Free Choice 2	IT*/EN
Frontiers in chemical research	8L	Core	EN
Educational Internship	10L	Core	EN
IV semester			
Course Name	ECTS	Type	Language
Master thesis internship	30L	Core	EN

*In English on demand

3. Double Degree Programme

Requirements for awarding a Master's degree of JLU and of UNIPD in the framework of the double degree programme:

- Students have to complete a one semester study stay at the partner university. During this time they have to pass all courses, seminars, lectures, classes or others (hereinafter referred to as modules) defined in the working plan mutually agreed upon by the academic coordinators at JLU and UNIPD. The working plan shall contain the typical

workload per semester at the partner university: i.e. at JLU 30 CP in total, at UNIPD 30 credits in total. Therefore, each university offers a defined set of modules taught in English. These modules should be fully accepted by both universities. An updated list has to be provided by both universities regularly.

- Furthermore, a master thesis has to be prepared under joint supervision by professors from both universities. It has to be successfully defended in front of an examination committee.

Schedule for Students' Exchange:

JLU students of the Masters' programme in Chemistry start their studies at JLU. During the first two semesters³, they have to successfully participate in 10 lecture-based modules (60 CP in total). During semester 3, they spend a one semester study stay at the UNIPD where they have to obtain the typical workload of 30 credits (obligatory). Afterwards, the students have two options: they complete their studies by preparing their Master's thesis, either staying at UNIPD or coming back at JLU (optional).

UNIPD students of the Masters' programme in Chemistry start their studies at UNIPD. During the first two semesters⁴, they have to successfully participate in courses totalling 60 credits. Afterwards, from semester 3 on, they spend a one semester study stay at the JLU where they have to obtain the typical workload of 30 CP (obligatory). Afterwards, the students have two options: they complete their studies by preparing their Master's thesis, either staying at JLU or coming back at UNIPD (optional).

4. Master thesis

The master thesis has to be written under the joint supervision of both universities and has to be defended in front of an examination committee. This committee must include at least one member from each university. It has to be submitted in English on schedule at the local university. The outcomes of the master thesis have to be defended in English.

5. Application and Entry Requirements

Admission procedures to the double degree programme are carried out by the home universities. At the same time, the host university reserves the right for making the final decision.

Both universities should nominate students of their Master's programmes. A maximum number of 5 students can be proposed per year.

As the entire study stay at the partner university will be conducted in English, knowledge of written and spoken English is required. Applicants must provide a certificate giving evidence of their proficiency in English. The following are accepted as evidence:

- 80 (iBT – internet based) in the TOEFL (Test of English as a Foreign Language),

³ (semester 1: October – March, semester 2: April – July)

⁴ (semester 1: October, 1 – Last week of January, semester 2: March, 1 – Second week of June)

- 6 points in the IELTS Academic Test (International English Language Testing System),
- a Bachelor's degree course completed in English,
- another approved English competency test (e.g. DAAD vd2, UNICert II B2, any B2 equivalent)

Master students who are admitted to the JLU Master's programme in Chemistry or the UNIPD Masters' programme in Chemistry are eligible to apply for the double degree programme. At the beginning of their second semester, applicants have to submit the following documents (in English) to the academic coordinator of their home university:

- Bachelor's Certificate,
- Letter of motivation,
- Study plan accepted by the academic coordinators of both universities,
- an approved English competency test (see above).

Additionally, at selection stage, UNIPD students and JLU students must have successfully participated in all first semesters' modules, having obtained at least 20 ECTS.

Eligible students will be admitted to the programme on the basis of interviews guided by the academic coordinator of their home university.

Based on the requirements and procedures mentioned above and based on academic merits, both universities should nominate students as candidates for the programme.

Following partner universities' academic coordinators' approval (including confirmation of study plan and supervision) students are provisionally admitted to the double degree programme by their home university. Selected students will be finally admitted to the host institution only after completing their first year of studies for at least 48 ECTS at the home institution before their mobility period.

6. Language

Studying during the study stay at the partner university is carried out in English. The Master thesis has to be written and defended in English.

7. Workload Approval and Grading Scheme

It is agreed that mutual recognition of the period of studies at the partner university is guaranteed. The workload will be calculated on the basis of the guidelines of the participating universities. At the JLU the basis for recognition is the Special Regulation for the programme in Chemistry leading to the Master of Science degree at JLU.⁵ At UNIPD the basis for recognition is the teaching regulations of the Master degree in Chemistry (*"Regolamento Didattico del Corso di Laurea Magistrale in Chimica"*) and its annexes.

⁵ https://www.uni-giessen.de/mug/7/findex36.html/7_36_08_2_C

Workload Approval:

Gaining the Master's degree of JLU and of UNIPD in the framework of the double degree programme requires that students pass modules (i.e. courses) to the extent of a typical one semester workload at the partner university: at JLU 30 CP in total, at UNIPD 30 credits in total.

Mutual recognition of study periods (modules/courses resp. CP/credits) is implemented on the basis of the following tables, which contain a comparison of workload at JLU and UNIPD.

Workload approval at JLU:

	JLU	UNIPD
	Modules (CP)	Courses (credits)
1. Year		
	Solid State and Materials Chemistry (6)	Inorganic Chemistry III a (6/10)
	Methods 1: Molecular Analytics (6)	Analytical Chemistry of the Environment, 2nd Semester (6/6)
	Physical Chemistry 4 (6)	Physical Chemistry IV a (6/10)
	Organic Chemistry 4 (6)	Organic Chemistry IV a (6/10)
	Methods 2: Analytics of Solids (6)	Physical Chemistry IV b (4/10)
	Molecular Catalysis (6)	Inorganic Chemistry III b, (4/10) Organic Chemistry IV b, (4/10)
	Elective Module 1 (6)	Optional 1 (6)
	Elective Module 2 (6)	Optional 2 (6)
	Elective Module 3 (6)	Optional 3 (6)
	Elective Module 4 (6)	Optional 4 (6)
3. Semester		
	In-depth research module I (10 CP)	Free Choice 1 (6/6) Free Choice 2 (6/6)
	In-depth research module II (10 CP)	Frontiers in chemical research (8/8)
	Specialisation research module (10 CP)	Internship (10/10)
4. Semester		
	Master thesis (30)	Master thesis (30/30)
	120 CP	120 CP

Workload approval at UNIPD:

	UNIPD	JLU
	Courses (credits)	Modules (CP)
1. Semester		
	Inorganic Chemistry III (10/10)	Solid State and Materials Chemistry (6) Molecular Catalysis (3/6)
	Physical Chemistry IV (10/10)	Physical Chemistry 4 (6) Methods 2: Analytics of Solids (6)
	Organic Chemistry IV (10/10)	Organic Chemistry 4 (6) Molecular Catalysis (3/6)

2.Semester		
	Analytical Chemistry of the Environment (6/6)	Methods 1: Molecular Analytics (6)
	Optional 1 (6/6)	Elective Module 1 (6)
	Optional 2 (6/6)	Elective Module 2 (6)
	Optional 3 (6/6)	Elective Module 3 (6)
	Optional 4 (6/6)	Elective Module 4 (6)
3. Semester		
	Free Choice 1 (6/6)	In-depth research module I (5/10 CP)
	Free Choice 2 (6/6)	In-depth research module I (5/10 CP)
	Frontiers in chemical research (8/8)	In-depth research module II (10 CP)
	Internship (10/10)	Specialisation research module (10 CP)
4.Semester		
	Master thesis (30/30)	Master thesis (30)
	120 CP	120 CP

Comparative Grading Scheme:

All work performed within modules shall be graded in accordance with the grading scheme applicable at the universities in question.

For the evaluation of the Masters' thesis students receive one grade of each grading scheme: one grade from UNIPD and one grade from JLU by the supervisors of the respective university.

Comparative table of JLU/UNIPD module grades:

JLU		Percentages for the evaluation of module examinations (%)	UNIPD	
Grade points	Verbal grades		Grades	Verbal grades
15	very good with distinction	≥97	30 e lode	
14	very good	≥92	30	
13	very good	≥87	28-29	
12	Good	≥82	27	
11	Good	≥77	26	
10	Good	≥73	24-25	
9	satisfactory	≥68	23	
8	satisfactory	≥64	22	
7	satisfactory	≥59	20-21	
6	sufficient	≥54	19	
5	sufficient	≥50	18	

4	Fail	≥45	16-17	
3	Fail	≥38	14-15	
2	Fail	≥32	12-13	
1	Fail	≥21	8-11	
0	Fail	≥0	0-7	

For approval of workload and grading a summary table should be provided in English for each student by the corresponding university. The summary table should also contain the title of the modules, workload and the grades (Transcript of Records). In order to arrive at the overall grade, the module grades at JLU should be converted into UNIPD grades and vice versa in accordance with the table presented above.

8. Master's Certificate

Students who meet academic requirements (provided that no module is finally failed) in the framework of the double degree programme should be awarded two Master's Certificates: a Master's certificate of JLU („Master of Science“) and a Master's certificate of UNIPD („Master of Science“). Both certificates must refer to the bilateral double degree programme. Students also receive a Certificate of Examination including Master's classification. Both universities provide Diploma Supplements.

9. Academic coordination

To ensure and facilitate the implementation of the double degree programme, each institution shall appoint an academic coordinator as contact person. The coordinators can be addressed by students, JLU and UNIPD colleagues of the double degree programme. Besides admitting applicants they are authorized persons for accepting students' study plans and workload approval.

List 1 (JLU)

Faculty members and professors teaching in chemistry:

Full professors can be chosen as thesis advisors; all listed faculty members offer research-based courses.

Faculty/Advisor	Institute	Research subjects (for the definition of research projects at JLU)
Prof. Dr. J. Janek	Physical Chemistry	Solid state ionics, fuel cell materials, battery materials, mixed conductors, solid state electrochemistry
Dr. R. Marschall	Physical Chemistry	Photoelectrochemistry, materials for solar harvesting
Prof. Dr. D. Mollenhauer	Theoretical Chemistry	Computer-based modeling of interfaces and surfaces
Prof. Dr. H. Over	Physical Chemistry	Surface science, heterogeneous catalysis, electrocatalysis, surface analysis
Prof. Dr. S. Schindler	Inorganic Chemistry	Complex chemistry
Prof. Dr. P. R. Schreiner	Organic Chemistry	Synthesis of organic molecules, computational chemistry
Prof. Dr. B. Smarsly	Physical/Inorg. Chemistry	Nanostructured materials, porous materials, materials for catalysis and sensing
Prof. Dr. R. Göttlich	Organic Chemistry	Synthesis, photoactive compounds and materials
Prof. Dr. H. Wegner	Organic Chemistry	Carbon-based materials, synthesis
Prof. Dr. Albrecht Bindereif	Biochemistry	
Prof. Dr. Gerd Ham-scher	Food Chemistry	
Prof. Dr. Holger Zorn	Food Chemistry	
Prof. Dr. Wolf-Eckhard Müller	Inorganic Chemistry	
Prof. Dr. Martin Rühl	Food Chemistry	
Prof. Dr. Bernhard Spengler	Analytical Chemistry	
Prof. Dr. Katja Strässer	Biochemistry	
Dr. Wolfgang Zeier	Physical Chemistry	
Prof. Dr. Nicole Graulich	Didactics, teaching chemistry	