JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

Der Präsident

Mitteilungen der Justus-Liebig-Universität Gießen

Ausgabe vom

07.02.2022

7.36.07 Nr. 1

Spezielle Ordnung für den Masterstudiengang „Materialwissenschaft“

Zwölfter Beschluss zur Änderung der Speziellen Ordnung für den Masterstudiengang „Materialwissenschaft“ des Fachbereichs 07 –Mathematik und Informatik, Physik, Geographie – und des Fachbereichs 08 – Biologie und Chemie – der Justus-Liebig-Universität Gießen

Aufgrund von § 44 Abs. 1 des Hessischen Hochschulgesetzes vom 14. Dezember 2009 haben die Fachbereichsräte des Fachbereichs 07 – Mathematik und Informatik, Physik und Geographie – am 05.02.2020 und des Fachbereichs 08 – Biologie und Chemie – am 15.01.2020 die nachstehenden Änderungen beschlossen:

§ 1
Änderungen

Die Spezielle Ordnung für den Masterstudiengang „Materialwissenschaft“ vom 04.05./25.05.2005, zuletzt geändert durch Beschluss vom 13.06./12.6.2019, wird wie folgt geändert:

1. Anlage 4a: Vereinbarung erhält folgende Fassung:

Double Degree Agreement on Master’s level in Material Science between

the Faculty of Biology and Chemistry and the Faculty of Mathematics, Computer Science, Physics, Geography, Justus-Liebig-University Giessen, Germany, and

the Graduate School of Engineering Science, Osaka University

1. Index

2. Aims

Based on the agreement of Justus-Liebig-University (JLU) and Osaka University (OU) both universities establish a double degree programme on Master's level in material science. The programme provides the opportunity for master students of material science at JLU and for master students of the Graduate School of Engineering Science at OU to gain the Master's degree of both universities: the „Master of Science" of JLU and the „Master of Engineering" of OU.

3. Master's programmes

The double degree programme is based on the following two Master's programmes:

The **JLU Master's programme in Material Science** is commonly taught by Faculty 07 – Mathematics, Computer Science, Physics, Geography and Faculty 08 - Biology and Chemistry at the JLU. Starting every October, the 2 years long programme (i.e. 4 semesters) includes core modules in each subject, chemistry and physics, as well as optional modules in the first year (lecture-based modules). The second year is entirely devoted to research work. Students choose 3 research-oriented modules. 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, both faculties jointly confer the award of „Master of Science"(M.Sc.). Students receive a Master's certificate and a Certificate of Examination including Master's classification[1] and Transcript of Records (titles of all modules passed, workload, and grading, title of Master's thesis and grading).

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. electrochemistry, 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 material science.

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 subjects of the modules typically represent important fields in science and technology, i.e. colloid chemistry, electrochemistry, photovoltaics etc. During the first

[1] The M.Sc. award is classified according to an overall grading. The overall grade is calculated by dividing the total weighted grade points (grade points for each module multiplied by the credit points allocated to the module) by the total number of credit points.

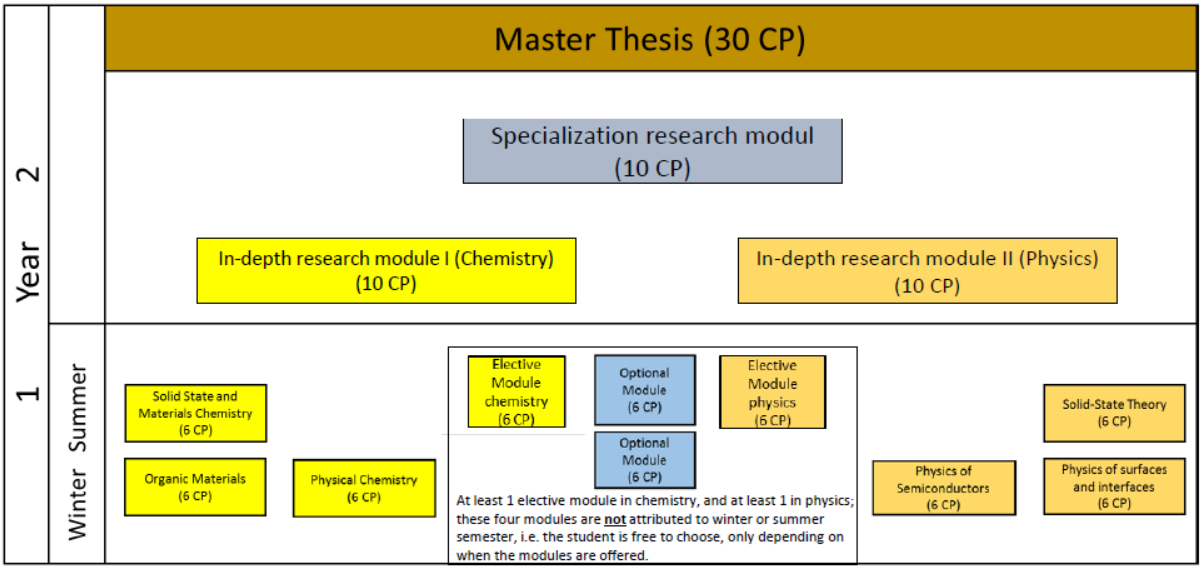
year, JLU students ~~choose~~ take 4 of these advanced modules in chemistry and 4 in physics. Additionally, they follow their own interests by choosing 2 optional lecture- and/or research-based modules (6 CP each).

- **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 (e.g. a specific analytical method). At JLU, students select three research modules during the second year: two in-depth research modules in materials science-oriented chemistry and physics, one specialisation research module for preparing their Master thesis. ~~Additionally, they follow their own interests by choosing 2 optional lecture- and/or research-based modules (6 CP each).~~

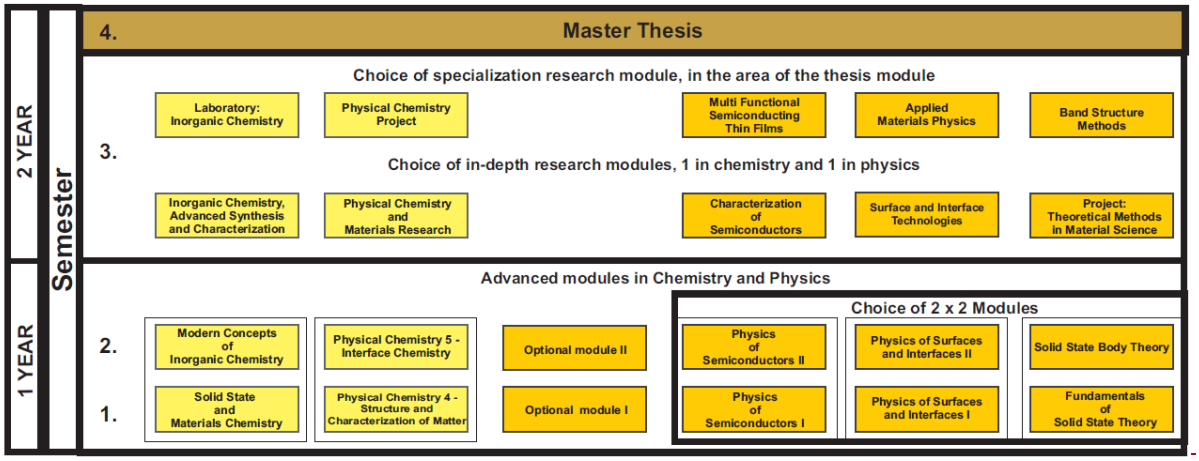
  - In accordance with the European Credit Transfer System (ECTS), the volume of learning activities (workload) required for achieving the Master's degree in material science equals 120 CP (ECTS Credit Points), i.e. 30 CP per semester / 60 CP per year. 1 CP is equivalent to an average working time of 30 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).

M.Sc. Material Science Schedule:



Comment: the MSc program can be started in winter or summer semester



The Graduate School of Engineering Science, Osaka University (ES-OU) has two Master's courses, a regular Japanese course and a Special Program of "Engineering Science 21st Century" in which all lectures and instruction are given in English. JLU students will be admitted to the Special Program of "Engineering Science 21st Century" in ES-OU. ~~In this program, students will be requested to choose at least nine lectures, four seminars and four special studies (Master thesis), as given in the following table. The list of lectures given in English is shown in list 2. Students can also have internship training at a Japanese company or research organization.~~

ES-OU aims to acquire a strong international reputation through increased exchange of students and researchers, and in joint research projects. For this objective, ES-OU has decided to offer a new interdisciplinary program, in which all lectures, as well as all instructions and supervision in research-related activities and seminars are given in English. The students are not required to learn Japanese to join this program. In this program, globally recognized and highly qualified graduates are expected to be educated under the guiding principles of ES-OU, which strives to integrate science and technology.

Outline and Features of the Program

1) The aim of this program is to develop human resources with high level, creative and flexible problem-solving ability. This is achieved through multi- and interdisciplinary research training, seminars, and lectures, given by prominent professors in their respective fields.

2) Master's Course students will be requested to choose at least nine elective subjects, as well as eight compulsory subjects, four seminars and four special studies (Master Thesis). The necessary credits for completion is 18 credits for elective subjects and 12 credits for compulsory subjects.

3) The opportunity for an internship at a prominent Japanese company or research organization will be provided in order to increase the knowledge and experience of cutting edge technologies. This internship will allow international students to become discerning and well-balanced scientists, with a deeper understanding of the Japanese society. The internship will also meet the requirements of the international students who wish to have practical experience in the industry.

M.Eng. Schedule (Special Program of "Engineering Science 21st Century"):

	Master Thesis		
2 year	Seminar Ⅳ (1 credit) ・ Special Study Ⅳ (2 credits)	Choose of at least 9 lectures (2 credits each)	Research Training for Master's Thesis
	Seminar Ⅲ (1 credit) ・ Special Study Ⅲ (2 credits)		
1 year	Seminar Ⅱ (1 credit) ・ Special Study Ⅱ (2 credits)		
	Seminar Ⅰ (1 credit) ・ Special Study Ⅰ (2 credits)		
	required subjects	elective subjects	

	Master Thesis		
2year	Seminar Ⅳ (1 credit) ・ Special Study Ⅳ (2 credits)	Choice of at least 9 lectures (2 credits each)	Research Training for Master's Thesis
	Seminar Ⅲ (1 credit) ・ Special Study Ⅲ (2 credits)		
1year	Seminar Ⅱ (1 credit) ・ Special Study Ⅱ (2 credits)		
	Seminar Ⅰ (1 credit) ・ Special Study Ⅰ (2 credits)		
	required subjects	elective subjects	

4. Double Degree Programme

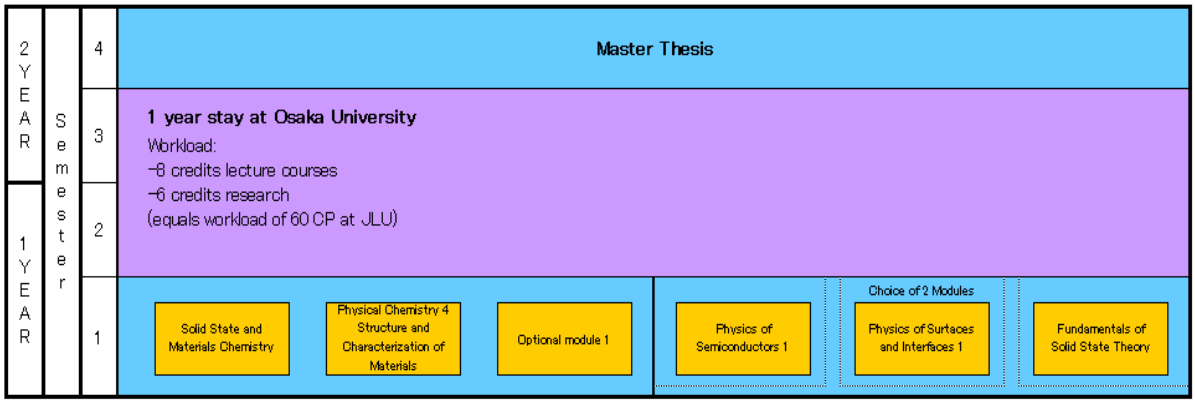
Requirements for awarding a Master's degree of JLU and of OU in the framework of the double degree programme:

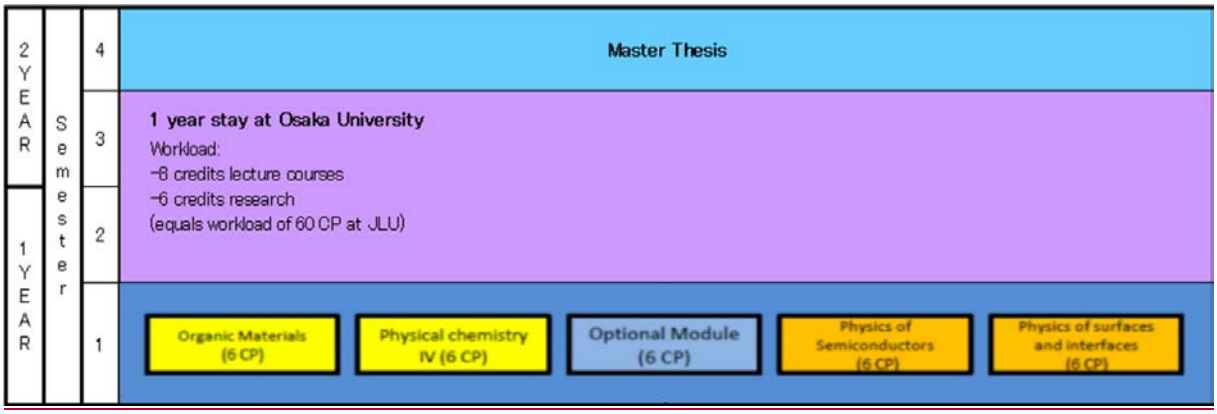
- Students have to complete a one year study stay at the partner university. During this time, they have to pass all courses, seminars, lectures, classes or others (hereinafter referred to as modules) defined in the working plan mutually agreed upon by the academic coordinators at JLU and ES-OU. The working plan shall contain the typical workload per year at the partner university: i.e. at JLU 60 CP in total (lecture based and research modules), at ES-OU 8 credits lecture course (elective) and 6 credits research (required). Therefore, each university offers a defined set of modules (i.e. lecture courses) taught in English. These modules (i.e. lecture courses) should be fully accepted by both universities. An updated list has to be provided by both universities regularly.
- Furthermore, the master thesis has to be written under joint supervision by professors from both universities and has to be defended in front of an examination committee.

Schedule for Students' Exchange:

JLU students of the Masters' programme in material science start their studies in October at JLU (semester 1: October - March). During the first semester, they have to successfully participate in 5 lecture-based modules (30 CP in total). Afterwards, from April on, they spend a one year study stay (2 semesters) at the ES-OU ~~Graduate School of Engineering Science~~ where they have to obtain 8 credits by lecture courses (elective) and 6 credits by research (required). After coming back to the JLU, students complete their studies by preparing and defending their master thesis.

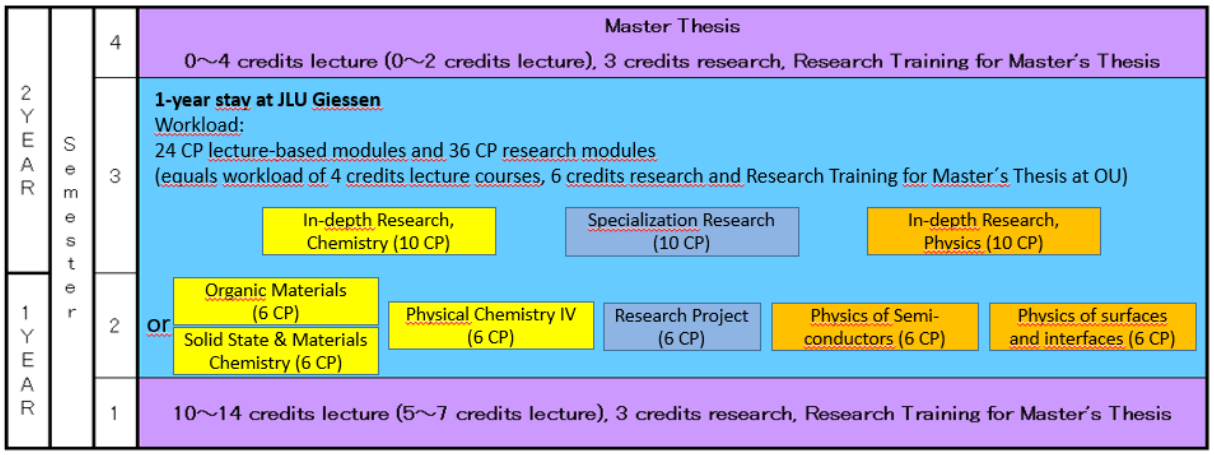
Schedule for JLU students:



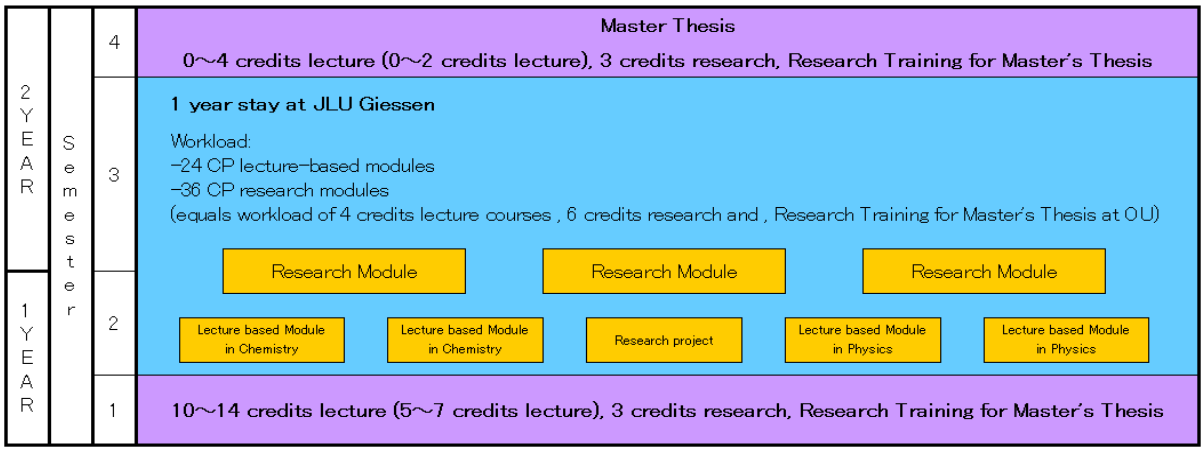


ES-OU students of the Master's program ~~students of the Graduate School of Engineering Science~~ start their studies in April at OU. During their first semester (from April - September) they typically obtain 10 credits by lecture courses (elective) and 3 credits by research (required). From October on, they spend a one year study stay (2 semesters) at the JLU where they have to obtain 60 CP in total: Students choose 4 lecture-based modules (two in each subject, chemistry and physics) and a minor research project module (6 CP each). Furthermore, depending on their research profile students choose 3 research modules (10 CP each), in consultation with their supervisor. Back at ~~the~~ OU, students complete their studies by preparing and defending their master thesis. In addition to the described schedule, ES-OU students can also start in their first semester (April) at JLU and spend their first year at JLU before returning to OU. These students will follow the same study programme at JLU as those coming in their second semester.

Schedule for OU students:



*Students can replace one of the modules "Physics of Semiconductors (6 CP)" or "Physics of surfaces and interfaces (6 CP)" by the module "Solid State Theory (6 CP)".



5. Master thesis

After returning to their home university, students continue their research work and finalise their 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.

Outcomes of the students' research work at the partner university shall be included in their Master thesis. These deliverables have to be specified as being gained at the partner university. The master thesis has to be submitted in English on schedule at the students' home university. One copy of the master thesis has to be provided for each supervisor at JLU and at ES-OU. The outcomes of the master thesis have to be defended in English in front of an examination committee. The supervisor of the partner university has to be enabled to participate in the committee (in person or via internet).

6. 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 (in addition, ES-OU may nominate students which are at the end of their Bachelors programme for starting at JLU in April). 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),
- 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. at JLU DAAD vd2 or UNIcert II European Level B2)

Master students who are admitted to the JLU Master's programme in Material Science or the OU Masters' programme at the Graduate School of Engineering Science are eligible to apply for the double degree programme. In addition, students in their last Bachelor semester (see §3 of the agreement) may apply. At the beginning of the semester prior to the exchange~~During their first semester~~, applicants have to submit the following documents (in English) to the academic coordinator of their home university:

- Bachelor's Certificate (not applicable for ES-OU students starting at JLU in April),
- Letter of motivation,
- Working plan accepted by a professor and the academic coordinator of their home university,
- Letter confirming supervision by a professor of the partner university,
- an approved English competency test (see above).

Additionally, JLU students must prove that they are successfully participating in all first semester modules (30 CP) and passed exams of at least four of them (24 CP) prior to the exchange.

Students may also 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, both universities should nominate students as candidates for the programme. By the partner universities' academic coordinators' approval (including confirmation of working plan and supervision) students are admitted to the double degree programme by their home university.

7. 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.

8. 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 Material Science leading to the Master of Science degree at Justus Liebig University Giessen:

https://www.uni-giessen.de/cms/mug/7/findex36.html/7_36_07_1_M.

At OU: http://www.osaka-u.ac.jp/jp/about/kitei/reiki_honbun/u035RG00000231.html

Workload Approval:

Gaining the Master's degree of JLU and of OU in the framework of the double degree programme requires that students pass modules (i.e. course work) to the extent of a typical one year workload at the partner university:

- at JLU 60 CP in total (lecture based and research modules),
- at ES-OU 8 credits lecture courses (elective), 6 credits research (required).

Mutual recognition of study periods (modules/course work resp. CP/credits) is implemented on the basis of the following tables which contain a comparison of workload at JLU and ES-OU.

Workload approval for JLU students:

	Approved as *(in italics)*	
	JLU	**ES-OU**
1.Semester (JLU)	30 CP (5 x 6 CP modules)	*10 credits lecture (5 x 2 credits lecture)*
2.+3.Semester (ES-OU)	*24 CP (4 x 6 CP modules)* *36 CP research modules*	8 credits lecture (4 x 2 credits lecture) 6 credits research
4.Semester (JLU)	30 CP Master thesis	*6 credits research*
Σ	**120 CP**	**18 credits lecture, 12 credits research**

Workload approval for OU students (the same workload holds true for ES-OU students going to JLU in their first semester):

	Approved as *(in italics)*	
	ES-OU	**JLU**
1.Semester (ES-OU)	10~14 credits lecture (5~7 x 2 credits lecture) 3 credits research	*30 CP (5 x 6 CP modules)*
2.+3.Semester (JLU)	*4 credits lecture (2 x 2credits lecture)* *6 credits research*	24 CP (4 x 6 CP lecture based modules) 36 CP (1 x 6 CP research project, 3 x 10 CP research modules)
4.Semester (ES-OU)	*0~4 credits lecture (0~2 x 2credits lecture)* 3 credits research, Master-Thesis	*30 CP*
Σ	**18 credits lecture, 12 credits research**	**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.

Comparative table of JLU/OU grades:

JLU			**OU**		
Percentages for the evaluation	**Grades**	**Verbal grades**	**Percentages for the evaluation**	**Grades**	**Verbal grades**
≥ 97	15	very good with distinction	≥ 90	S	—
≥ 92	14	very good			—
≥ 87	13	very good			—
≥ 82	12	Good	80 – 89	A	—
≥ 77	11	Good			—
≥ 73	10	Good	70 – 79	B	—
≥ 68	9	satisfactory			—
≥ 64	8	satisfactory	60 – 69	C	—
≥ 59	7	satisfactory			—
≥ 54	6	sufficient			—
≥ 50	5	sufficient			—
< 50	4-0	Fail	< 60	F	Fail

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 OU grades and vice versa in accordance with the table presented above.

9. 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 OU („Master of Engineering “). Both certificates must refer to the bilateral double degree programme. Students also receive a Certificate of Examination including Master's classification and a Transcript of Records. Both universities provide Diploma Supplements.

10. 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 ES-OU colleagues of the double degree programme. Besides admitting applicants, they are authorized persons for accepting students' working plans and workload approval.

List 1 (JLU) (year 2014/2015)

Lecture-based modules:

These modules (6 CP) are run either in the winter or summer semester. Each year OU will be provided with a list of available modules.

Course Code	Title of course	Responsible Professor	Institute
Chemistry-MNW03	Metal and Ligand reactivity (Chemistry of complexes)	Schindler	Inorganic Chemistry
Chemistry-MNW04	Computational chemistry/Molecular Modeling	Schreiner	Organic Chemistry
Chemistry-MNW06	Scientific Writing and Data Dissemination	Schreiner	Organic Chemistry
Chemistry-MNW07	Matrix Isolation Techniques/Reactive Intermediates	Schreiner	Organic Chemistry
Chemistry-MNW15	Colloid chemistry	Smarsly	Physical Chemistry
Chemistry-MNW16	Electrochemistry I – From Basics to Application	Janek	Physical Chemistry
Chemistry-MNW17	Electrochemistry II – Electrochemical Energy Technologies	Janek	Physical Chemistry
Chemistry-MNW18	Solid State Reactions	Janek	Physical Chemistry
Chemistry-MNW24	Surface chemistry and metal catalysis	Over	Physical Chemistry
Chemistry-MNW25	Electrochemistry III – Lab course in Electrochemistry and Interfaces	Janek	Physical Chemistry
Chemistry-MNW26	Inorganic Reaction Mechanisms	Schindler	Inorganic Chemistry
Chemistry-MNW29	Research Topics in Inorganic Chemistry I	Schindler/Smarsly	Inorganic Chemistry
Chemistry-MNW31	Research Topics in Organic Chemistry I	Schreiner/Wegner /Göttlich	Organic Chemistry
Chemistry-MNW34	Modern Aspects of Physical Chemistry	Janek/Over/Smarsly	Physical Chemistry
Chemistry-MNW36	(Organo)Catalysis and Synthesis	Schreiner/Wegner/Göttlich	Organic Chemistry
Physics-MP13	Semiconductor Physics I	Meyer/Eickhoff /Klar	Solid State Physics
Physics-MP14	Semiconductor Physics II	Meyer/Eickhoff /Klar	Solid State Physics
Physics-MP16	Introduction to Solid State Theory	Heiliger	Solid State Physics

~~Physics-MP17~~	~~Solid State Theory~~	~~Heiliger~~	~~Solid State Physics~~
~~Physics-MP25~~	~~Nano- and Microstructures in Sensor- and Actuator Systems~~	~~Eickhoff/Klar/Henning~~	~~Solid State Physics~~
~~Physics-MP35~~	~~Surface and Interface Physics I~~	~~Schlettwein/Dürr/ Schirmeisen~~	~~Applied Physics~~

~~Research based modules:~~

~~Important: Research modules (10 CP) are directly arranged with a professor and can be flexibly defined! Modules may be combined to form e.g. one 20 CP module. The subject depends very much on the research interests of the student.~~

~~Course Code~~	~~Title~~	~~Responsible Professor~~	~~Institute~~
~~Chemistry-MNV01~~	~~Inorganic Chemistry, Advanced Synthesis and Characterisation~~	~~Schindler, Smarsly, N.N.~~	~~Inorganic Chemistry~~
~~Chemistry-MNV02~~	~~Advanced Organic Chemistry Laboratory~~	~~Schreiner, Göttlich, Wegner~~	~~Organic Chemistry~~
~~Chemistry-MNV03~~	~~Physical Chemistry and Materials Research~~	~~Janek, Smarsly, Over~~	~~Physical Chemistry~~
~~Chemistry-MNS01~~	~~Project Work Inorganic Chemistry~~	~~Schindler, Smarsly, N.N.~~	~~Inorganic Chemistry~~
~~Chemistry-MNS02~~	~~Project Work Organic Chemistry~~	~~Schreiner, Göttlich, Wegner~~	~~Organic Chemistry~~
~~Chemistry-MNS03~~	~~Project Work Physical Chemistry~~	~~Janek, Smarsly, Over~~	~~Physical Chemistry~~
~~Physics-MP-28-B~~	~~Modern Technologies of Conductive and Dielectric Materials~~	~~Göddenhenrich/ Schlettwein/Thummes~~	~~Applied Physics~~
~~Physics-MP-28-G~~	~~Micro- and Nanostructured Semiconductors~~	~~Meyer/Klar /Eickhoff~~	~~Solid State Physics~~
~~Physics-MP-28-H~~	~~Bandstructure Calculations~~	~~Heiliger~~	~~Theoretical Physics~~
~~Physics-MP-28-Q~~	~~Synthesis of Micro- and Nano-Structured Materials~~	~~Klar, Meyer, Eickhoff, Polity, Hoffmann~~	~~Solid State Physics~~
~~Physics-MP-28-R~~	~~Surface and Interface Technologies~~	~~Dürr, Schirmeisen, Schlettwein~~	~~Applied Physics~~
~~MP-29-A~~	~~Multifunctional Thin Films~~	~~Klar, Meyer, Eickhoff~~	~~Solid State Physics~~
~~Physics-MP-29-B~~	~~Applied Material Physics~~	~~Göddenhenrich/ Schlettwein/Thummes~~	~~Applied Physics~~
~~Physics-MP-29-G~~	~~Green's Functions in Solid State Theory~~	~~Heiliger~~	~~Theoretical Physics~~

~~Physics-MP-29 L~~	~~Low Temperature Plasma Physics~~	~~Thoma, Mitic~~	~~Plasma Physics~~

~~Faculty members and professors teaching in materials science; Full professors can be chosen as advisors; all listed faculty members offer research-based courses.~~

~~Faculty/Advisor~~	~~Institute~~	~~Research subjects (for the definition of research projects at JLU)~~
~~Dr. P. Adelhelm~~	~~Physical Chemistry~~	~~Energy storage materials, battery materials, carbon materials, nanostructures materials~~
~~Prof. Dr. M. Dürr~~	~~Applied Physics~~	~~Surface science, Surface spectroscopy, mass spectrometry~~
~~Prof. Dr. M. Eickhoff~~	~~Solid State Physics~~	~~Semiconductor physics, Micro- and nanostructures, nanowires, sensors~~
~~Dr. M. Elm~~	~~Phys. Chem./Physics~~	~~Magnetic materials for spintronics, nanostructured magnetic and ionic materials~~
~~Prof. Dr. C. Heiliger~~	~~Theoretical Physics~~	~~Computer-based modeling and simulation of functional materials, semiconductors, thermoelectrics~~
~~Dr. D. Hofmann (apl. Prof.)~~	~~Solid State Physics~~	~~Semiconductors~~
~~Prof. Dr. J. Janek~~	~~Physical Chemistry~~	~~Solid state ionics, fuel cell materials, battery materials, mixed conductors, solid state electrochemistry~~
~~Prof. Dr. P. J. Klar~~	~~Solid State Physics~~	~~Nano- and microstructured materials, semiconductors,~~
~~Dr. R. Marschall~~	~~Physical Chemistry~~	~~Photoelectrochemistry, materials for solar harvesting~~
~~Prof. Dr. A. Müller~~	~~Inorganic Chemistry~~	~~Thermoelectric materials~~
~~Dr. A. Polity (PD)~~	~~Solid State Physics~~	~~Thin films and thin film deposition, sputtering~~
~~Prof. Dr. Z. Mitic~~	~~Plasma Physics~~	~~Plasma techniques for materials science~~
~~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. A. Schirmeisen~~	~~Applied Physics~~	~~Surface science, scanning probe microscopy~~
~~Prof. Dr. D. Schlettwein~~	~~Applied Physics~~	~~Hybrid materials, photochemistry, photovoltaics, photoelectrochemistry, organic semiconductors~~
~~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~~
~~Dr. J. Teubert~~	~~Solid State Physics~~	~~Semiconductor physics~~
~~Prof. Dr. M. Thoma~~	~~Plasma Physics~~	~~Plasma-based techniques~~
~~Prof. Dr. R. Göttlich~~	~~Organic Chemsitry~~	~~Synthesis, photoactive compounds and materials~~
~~Prof. Dr. H. Wegner~~	~~Organic Chemistry~~	~~Carbon-based materials, synthesis~~

~~Prof. Dr. M. Wickleder~~	~~Inorganic Chemistry~~	~~Functional materials containing oxoanions~~

~~List 2 (OU) (year 2014/2015)~~

~~List of lectures~~

~~o=Annual classes~~

~~*=Biennial classes~~

~~Lectures~~	~~Credits~~
~~Introduction to Engineering Science~~	~~2(o)~~
~~Solid State Spectroscopy~~	~~2(o)~~
~~Nano-materials and spins~~	~~2(o)~~
~~Molecular Nanotechnology~~	~~2(o)~~
~~Properties of Materials~~	~~2(o)~~
~~Advanced Physical Chemistry~~	~~2(o)~~
~~Advanced Organic Chemistry~~	~~2(o)~~
~~Advanced Chemistry for Material Science~~	~~2(o)~~
~~Bio-Inspired Chemical Engineering~~	~~2(o)~~
~~Science and Engineering of Correlated Electron Materials~~	~~2(o)~~
~~Theoretical Materials Science~~	~~2(o)~~
~~Photophysics of Nanoscale Materials~~	~~2(o)~~
~~Frontier of Nano-scale Materials~~	~~2(o)~~
~~Engineering Science Research Internship~~	~~2(o)~~
~~Turbulence Dynamics~~	~~2(*)~~
~~Topics in Nonlinear Dynamics~~	~~2(*)~~
~~Viscous Fluid Mechanics~~	~~2(*)~~
~~Strength of Structure~~	~~2(*)~~
~~Ultrasonic Techniques~~	~~2(*)~~
~~Topics in Fluids Engineering for Space Machinery~~	~~2(*)~~
~~Topics on Robotics~~	~~2(*)~~
~~Stability Analysis of Dynamical Systems~~	~~2(*)~~
~~Advanced Theoretical Solid Mechanics~~	~~2(*)~~
~~Advanced Computational Mechanics~~	~~2(*)~~
~~Theory of Optimum Design and Synthesis~~	~~2(*)~~

~~Biological System Engineering~~	~~2(*)~~
~~Electronic Device Engineering~~	~~2(*)~~
~~Quantum Information Science~~	~~2(*)~~
~~Advanced Optoelectronics~~	~~2(o)~~
~~Systems and Control Theory~~	~~2(*)~~
~~Optimal Systems Theory~~	~~2(*)~~
~~Signal Analysis Theory~~	~~2(*)~~
~~Theory of Systems Analysis~~	~~2(*)~~
~~Applied Robotics~~	~~2(*)~~
~~Intelligent Robotics~~	~~2(*)~~
~~Mixed Reality Systems~~	~~2(*)~~
~~Advanced Robot Systems~~	~~2(*)~~
~~Imaging Systems~~	~~2(*)~~
~~Advanced Human Interfaces~~	~~2(*)~~
~~Communication Robot~~	~~2(*)~~
~~Database Systems~~	~~2(*)~~
~~Topics in Mathematical Sciences I~~	~~2(*)~~
~~Topics in Mathematical Sciences II~~	~~2(*)~~
~~Nonlinear System Theory~~	~~2(o)~~
~~Systems Optimization and Analysis~~	~~2(*)~~
~~Intelligent Mathematical Programming System~~	~~2(*)~~
~~Topics in Mathematical Statistics I~~	~~2(*)~~
~~Topics in Mathematical Statistics II~~	~~2(*)~~
~~Material Process Engineering~~	~~2(*)~~
~~Bioreaction Engineering~~	~~2(*)~~
~~Biomechanical Engineering~~	~~2(*)~~
~~Biomedical Simulation and Measurement~~	~~2(*)~~
~~Medical Information Technology~~	~~2(*)~~
~~Solid State Devices~~	~~2(o)~~
~~Opto- and Quantum Electronics~~	~~2(o)~~
~~Advanced Mathematical Science A~~	~~2(o)~~
~~Advanced Mathematical Science B~~	~~2(o)~~
~~Advanced Mathematical Science C~~	~~2(o)~~

Department of Materials Engineering Science

Graduate School of Engineering Science, Osaka University
as of June 2014

Division	Area	Research Group	Keywords	Professor
Materials Physics	Electron Correlation Physics	Theoretical Research Group of Strongly Correlated Systems	Topological insulators and superconductors, Exotic superconductors, Strongly correlated electron systems, Quantum magnetism, Quantum criticality, Mathematical physics	Prof. FUJIMOTO Satoshi
		Experimental Research Group for Spectrosoopy of Correlated Materials	Bulk-sensitive photoelectron spectroscopy (hard X-ray and extremely low-energy excitation), Bulk-sensitive soft x-ray angle-resolved photoemission, Fermiology for strongly correlated electron systems	Prof. SEKIYAMA Akira
		Experimental Research Group for Nanoscience	Nanostructures, Spintronics	Prof. SUZUKI Yoshishige
	Quantum Physics of Nanoscale Materials	Quantum Information and Quantum Optics Group	Quantum information, Quantum cryptography, Quantum computing, Entanglement manipulation, Quantum optics, New aspects of quantum mechanics	Prof. IMOTO Nobuyuki
		Group for Exploration of Functional Materials	Magnetism, Ferroelectricity, Correlated electron systems, Oxides, Crystal growth	Prof. KIMURA Tsuyoshi
		Experimental Research Group for Electron-correlated Matter Science	NMR/NQR Studies under Multiple Physical Environments, Novel Phases of Condensed Matters, High-Temperature Superconductivity, Quantum Magnetism, Strongly Correlated Electrons Systems	Prof. KITAOKA Yoshio
	Quantum Materials Physics	Optical and Quantum Information Science Group	Semiconductor quantum devices, Quantum electronics, Organic and bio-semiconductor nano-physics	Prof. MATSUMOTO Kazuhiko
		Condensed Matter Theory	First-principles calculation, Condensed matter theory, Materials prediction and design, Magnetism, Ferroelectricity, Superconductivity, Multiferroics	Prof. OGUCHI Tamio
Chemistry	Synthetic Chemistry	Synthetic Organic Chemistry Group	Environmentally benign process for molecular transformations, Simulation of enzymatic functions with metallo- and organocatalysts, Creation of functional orgaometallics	Prof. NAOTA Takeshi
		Synthetic Polymer Chemistry Group	Stereospecific Living Polymerization, Stereoregular Polymers, Precision Polymer Synthesis, Uniform Polymers, Functional Polymers, Polymer Characterization	Prof. KITAYAMA Tatsuki
		Organometallic Chemistry Group	Design and Synthesis of Homogeneous Molecular Catalysts, Organometallic Complexes, Metal Nanoclusters, Chiral Complexes, and Molecular Devices	Prof. MASHIMA Kazushi
	Molecular Organization Chemistry	Surface Chemistry Group	Energy Conversion, Electrode Interfaces, Ionic Liquid Interfacial Chemistry, Catalytic Reaction Mechanism, Electron Transfer at Interfaces	Prof. FUKUI Ken-ichi
		Biological Chemistry Group	Nucleic acids chemistry, Chemical synthesis of oligonucleotides, DNA damage, DNA repair, Biomolecular recognition, Protein–nucleic acid interactions	Prof. IWAI Shigenori
	Solar Energy Chemistry	Solar Energy Conversion	New materials for solar cells; Chemical processes for solar cell fabrication; Photocatalysis; Nanometer-sized metal particles; Nano-porous catalysts	Prof. MATSUMURA Michio
Chemical Engineering	Chemical Reaction Engineering	Nanoreaction Engineering Group	Chemical reaction engineering, porous materials, inorganic membranes, liquid crystals	Prof. NISHIYAMA Norikazu
		Quantum Chemical Engineering group	Quantum nonlinear optics, Materials-oriented quantum chemistry, Open-shell molecular systems, Quantum dynamics	Prof. NAKANO Masayoshi
		High-Performance Catalyst Group	Green Chemistry, Environmentally-benign organic synthesis, Inorganic crystallites, Dendrimer, Nanocluster	Prof. JITSUKAWA Koichiro
	Environment and Energy System	Transport Phenomena Control Group	Control of Heat and Mass Trasnfer, Liquid-Liquid Interface, Phase Change, Computational Fluid Dynamics	Prof. OKANO Yasunori
		Molecular-Aggregate Chemical Engineering Group	Soft Self-Organizing System, Distribution of Molecule at Mesoscale, Amphiphilic Molecule, Ionic Liquid, Molecular Simulation, Solution Theory	Prof. MATUBAYASI Nobuyuki
	Bioprocess Engineering	Bio-Inspired Chemical engineering Group	Bio-Inspired Chemical Engineering, Self-Assemblies, Engineering Science of Liposome, Molecular Recognition, Artificial Enzyme, Bioseparation	Prof. UMAKOSHI Hiroshi
		Bioreaction Engineering Group	Bioprocess, Bioreactor, Gene/metabolic Engineering, Tissue Engineering, Enviroment Bioengineering	Prof. TAYA Masahito
	Solar Energy Chemistry	Environmental Photochemical Engineering Group	Photocatalysts, Photofunctional Materials, Highly Selective Transformation of Organic Compounds, Photoluminescent Molecular Devices and Sensors	Prof. HIRAI Takayuki
Frontier Materials Science	Frontier Materials	Molecular Architectonics Research Group	Experimental and Theoretical Studies on Molecular-based and Molecular-scale Electronics, Spintronics and Thermoelectronics, and on Novel Molecular Architectures utilizing Fluctuations towards Brain-like Devices	Prof. TADA Hirokazu
		Experimental Research Group for Functional Molecules	Development of Functional Organic Materials for Optoelectronic Applications, Supramolecular Chemistry based on Two-Dimensional Self-Assembly on Surfaces, Creation of Functional Materials based on Multiple Molecular Interactions	Prof. TOBE Yoshito
		Theory Group of Advanced Materials Science	Computational materials design, Numerical simulation of many-body systems (Elucidation and prediction of new phase of matters under extreme conditions,The first-principles calculations and its development based on the quantum simulation)	Prof. KATAYAMA-YOSHIDA Hiroshi (Assoc. Prof. KUSAKABE Ko-ichi)
	Dynamics of Nanoscale Materials	Experimental Research Group for Coherence of Nanoscale Materials	Optical properties of semiconductor ultrathin films and nanoparticles, and strongly-correlated electron systems, Nonlinear laser spectroscopy, Ultrafast time-resolved spectroscopy, THz spectroscopy, SEM-cathodoluminescence, Optical fabrication and manipulation of nanoparticles	Prof. ASHIDA Masaaki
		Experimental Research Group for Fluctuation Dynamics in Condensed Phase	photochemistry, photofunctional molecule, three-dimensional three-pulse photon echo, ultrafast detection of photochemical reactions, laser-control of chemical reactions, time-resolved microscopy, single-molecule measurement, biomolecular fluctuation	Prof. MIYASAKA Hiroshi
	Quantum Science in Extreme Conditions	Experimental Research Group for Materials Science in Extreme Conditions	Material science at extreme conditions; Superconductivity, magnetism, structural phase transitions, new material and new function	Prof. SHIMIZU Katsuya
		Experimental Research Group for Materials Engineering Science in Nano-structure	Nano-fabrication of solids and semiconductors, Hetero-structure of oxides, Nano-materials device, Electronics of functional oxides	Prof. TANAKA Hidekazu

Department of Mechanical Science and Bioengineering

Graduate School of Engineering Science, Osaka University
as of June 2014

Division	Area	Research Group	Keywords	Professor
Nonlinear Mechanics	Mechanics of Fluids and Thermo-fluids	Thermal Engineering and Science Group	Turbulent Flows, Turbulence Control, Subcritical Transition to Turbulence, Heat Transfer Enhancement, Drag Reduction, Unsteady and Chaotic Thermal Convection Fields	Prof. KAWAHARA Genta
		Fluid Mechanics Group	Nonlinear Waves and Oscillations, Stability, Acoustics, Thermoacoustics, Shock, Soliton, Chaos, Break-up of liquid sheets and drops, Capillary effects, Level-set method, Periodic structures and localization, Localized mode	
	Mechanics of Solid Materials	Strength of Structure and Materials Group	Dynamic behavior of materials and structure, Biomimetics of plants, Hydrogen embrittlement of metals, Mechanical properties of functional materials, Development of new structural materials	Prof. KOBAYASHI Hidetoshi
		Solid Mechanics Group	Noncontact ultrasonic measurements, Characterization of emerging functional materials, Electromagnetic acoustic sensing, Biosensors, Resonance Ultrasound Microscopy, Micromechanics	Prof. HIRAO Masahiko
Mechanical Engineering	Propulsion Engineering	Molecular Fluid Dynamics Group	Molecular fluid dynamics for life science, environmental technology, and space engineering. Nanoscale medical device, Numerical design of next-generation battery, Atmospheric flow on planets, Micro/nanoscale multiphase flow, Coexistence of flow field and fluctuation, Ionic current, Non-equilibrium gas flow	Prof. KAWANO Satoyuki
		Fluids Engineering Group	Fluid Machinery, Turbopump Inducer, Artificial Heart, Flow Instability, Multiphase Flow, Cavitation, High Performance Computing of Computational Fluid Dynamics	Prof. SUGIYAMA Kazuyasu
	Mechano-informatics	Robotics and Mechatronics Group	Human–Robot Interface, Analysis of Human Movements, Human-like Musculoskeletal Robots, Human Skills Transfer to Robots, Robotic Orthosis, Assistance System for Single-Incision Laparoscopic Surgery	Prof. MIYAZAKI Fumio
		Theoretical Solid Mechanics Group	Predictive multiscale-multiphysics modeling and simulation of solids	Prof.OGATA Shigenobu
Bioengineering	Biomechanical Science	Biomechanics Group	Biomechanics of cells, tissues, and organs, Functional adaptation and remodeling, Biomaterials and tissue engineering, Computational biomechanics, Biofluid dynamics, Biomechanical Imaging	Prof. WADA Shigeo
		Mechanical and Bioengineering Systems Group	Biomechanical System Modeling, Computational Biomechanics, Cardiovascular Biomechanics, Rehabilitation Engineering, Welfare Engineering, Adaptive Structures and Systems, Optimum/Adaptive Structural Design, Smart Design Engineering	Prof. TANAKA Masao
		Bio-mechanical/physical informatics Group	Human model, Living Informatics, Bio-mechanical/physical signal analysis, Human stress sensing/control, Affordance analysis/design	Guest Prof. MATSUOKA Katsunori
	Biophysical Engineering	BioSystem Engineering Group	Cell Engineering, Tissue Engineering, Stem Cell Biotechnology, Regenerative Medicine,Brain-Machine Interface, Genome Science, Nanobiotechnology, Bioenergetics, Three-dimensional protein structure,Structural Biology, Biophysics,Protein Science	Prof. MIYAKE Jun
		Bio-Dynamics Group	Nonlinear dynamical system theory and its application to biology, Physiome,In silico human, Motor control, Biological rhythms, Cardiac arrhythmias, Systems biology, Biosignal processing, Homeodynamics	Prof. NOMURA Taishin
	Biomedical and Biophysical Measurements	Biomedical Photonics Group	Biomedical optics, Nanometer-scale optical microscope, Laser associated non-linear photonics, Analysis of chemical component in blood vessels and blood dynamics, Biosensor	Prof. ARAKI Tsutomu
		Bioimaging Group	Biomedical measurement, Medical image, CG, Visualization, Display system, VR, Haptic rendering, Human-computer interaction, Communication, Information sharing, Physics-based simulation, Complex Space	Prof. OSHIRO Osamu

Department of Systems Innovation

Graduate School of Engineering Science, Osaka University as of June 2014

Division	Area	Research Group	Keywords	Professor
Advanced Electronics and Optical Science	Solid State Electronics	Nanoelectronics Group	Group-IV semiconductor materials, Nitride semiconductor materials, Nanodots, Functional memory devices, Thermoelectric devices, Syncrotron radiation X-ray microdiffraction, Transmission electron microscopy	Prof. SAKAI Akira
		Optoelectronics Group	Thin-film solar cells, Thin-film displays, Amorphous semiconductors, nano-crystalline semiconductors, Modulation spectroscopy	Prof. OKAMOTO Hiroaki
		Nano-scale Physics & Device Group	Semiconductor spintronics, Low-temperature MBE, Metal/Semiconductor interface, Semiconductor/Oxide interface, Flexible electronics	Prof. HAMAYA Kohei
	Advanced Quantum Devices and Electronics	Advanced Quantum Device System Group	Nuclear quadrupole resonance(NQR), Mine detection, Baggage inspection, Nondestructive Evaluation, Superconducting interference device (SQUID), High temperature superconducting electronics	Prof. ITOZAKI Hideo
		Advanced Quantum Information Device Group	Quantum computers, Quantum information, Nuclear magnetic resonance (NMR), Electron spin resonance (ESR)	Prof. KITAGAWA Masahiro
	Optical Electronics	Microwave Photonics Group	Planar antennas, Adaptive antennas, Microwave photonics, High speed light modulators, Integrated optical circuits, Photonics crystals, Optical measurements, Optical scattering, Random media	Prof. OKAMURA Yasuyuki
		Information Photonics Group	Millimeter- and terahertz-wave photonics, Nano-structure photonics, Metamaterials, Ultrafast electronics, Photonic signal processing and measurement, Communication systems	Prof. NAGATSUMA Tadao
		Quantum Electronics Group	Laser cooling, Quantum information, Quantum optics, Ion trap, Laser stabilization, Frequency standard	Prof. URABE Shinji
	Center for Science and Technology under Extreme Conditions	Advanced Electronics Group	Atom technology, Nanoelectronics, Nanoprocessing, Scanning Probe Microscopy, Nano electron source, Nanometer analysis and characterization	Prof. ABE Masayuki
Systems Science and Applied Informatics	System Theory	Adaptive Robotics Group	Soft Robotics, Embodied Artificial Intelligence, Bio-mimetic Robotics, Bio-Robotics, Muscular-skeletal Robots, Humanoid Robots	Prof. HOSODA Koh
		Systems Analysis Group	Signal Analysis, Systems Analysis, Adaptive System, Noise suppressor, Nonlinear filtering	Prof. IIGUNI Youji
	Intelligent Systems	Applied Robotics Group	Robot Mechanism, Robot Vision, Ambient Intelligence, Nano-Micro Robotics, Humanoids & Multi-Legged Robots, Safety & Security Robotics, Human Robot Interaction	Prof. ARAI Tatsuo
		Intelligent Robotics Group	Interactive Intelligent Robots, Android Science, Learning and Developing Robot, Bio-inspired Robotics, Intelligent Sensor Network, Pattern Recognition, Brain-Machine Interface, Electromagnetic Linear Actuator	Prof. ISHIGURO Hiroshi
		Pattern Measurement Group	Vision Sensing, Image Engineering, 3D Measurement, Intelligent Sensing, Digital Archives, Augmented Reality	Prof. SATO Kosuke
		Human Interface Group	Human Communication, Intelligent User Interface, Media Technology, Web Intelligence, Mobile Computing	Prof. NISHIDA Shogo
Mathematical Science	Mathematical Modelling	Differential Equation Group	Nonlinear partial differential equations, Variational methods, Singularity formation, Mathematical fluid dynamics, Mathematical sciences	Prof.KOBAYASHI Takayuki
		Applied Analysis Group	Nonlinear analysis, Mathematical modeling, Numerical simulation, Mathematical medicine, Nonlinear partial differential equations, Integrable systems, Mathematical physics, Source identification	Prof. SUZUKI Takashi
	Statistical Science	Statistical Analysis Group	Model Selection, High-Dimensional Statistics, Machine Learning, Bioinformatics, Complex Networks, Statistical Graphics, Statistical Computing, Resampling, Nonparametric Statistics	Prof. SHIMODAIRA Hidetoshi
		Statistical Science Group	Multivariate analysis, Structural equation modeling, Statistical causal inference, information loss, time series analysis, MCMC	Prof. KANO Yutaka
Mathematical Science for Social Systems	Mathematical and Statistical Finance	Research Group of Statistical Inference	Financial data analysis, Time series analysis, High frequency data analysis, Actuarial mathematics, Statistics for stochastic differential equations, Monte Carlo methods, Mathematical statistics	Prof. UCHIDA Masayuki
		Research Group of Mathematical Modeling in Finance	Long-term optimal investment, Dynamic portfolio selection, Asset price modeling, Stochastic control, Differential games, Dynamic programming equations, Optimal execution, Liquidity problem, Quantitative risk management	Prof. SEKINE Jun
		Research Group of Stochastic Analysis	Analysis on path space, Fractal, Anomalous structure, Diffusion process, Heat equation, Stochastic control, H-J-B equation, Nonlinear filtering equation	Prof. HINO Masanori
	Theoretical Systems Science	Research Group of Complex Systems	Systems theory, Discrete event systems, Hybrid systems, Embedded systems, Nonlinear systems, Evolutionary game, Cyber-physical systems	Prof. USHIO Toshimitsu
		Research Group of Systems Optimization and Decision Making	Decision making, Systems optimization, Combinatorial optimization, Game theory, Fuzzy systems, Data mining, Supply chain management	Prof. INUIGUCHI Masahiro

2. § 27 wird wie folgt neu gefasst:

   „Diese Ordnung in der Fassung des zwölften Änderungsbeschlusses gilt für alle Studierenden ab dem Sommersemester 2020; bis dahin gilt die bisherige Ordnung fort.“

§ 2
Inkrafttreten

Dieser Beschluss tritt am Tage nach seiner Verkündung in Kraft. Der neue Wortlaut der geänderten Ordnung wird in den Mitteilungen der Universität Gießen bekannt gemacht.

Gießen, den #. ### ####
Prof. Joybrato Mukherjee
Präsident der Justus-Liebig-Universität Gießen