JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

Der Präsident

Mitteilungen der Justus-Liebig-Universität Gießen

Ausgabe vom **17.10.2022**

07.36.08 Nr. 1
Spezielle Ordnung für den Masterstudiengang Chemie

Erster Beschluss zur Änderung der Speziellen Ordnung für den Masterstudiengang Chemie des Fachbereichs 08 – Biologie und Chemie – der Justus-Liebig-Universität Gießen

Aufgrund von § 50 Abs. 1 des Hessischen Hochschulgesetzes vom 14. Dezember 2021 hat der Fachbereichsrat des Fachbereichs 08 – Biologie und Chemie – am 11.05.2022 die nachstehenden Änderungen beschlossen:

Art. 1
Änderungen

Die Spezielle Ordnung für den Masterstudiengang Chemie des Fachbereichs 08 – Biologie und Chemie – vom 16.Februar 2022 wird wie folgt geändert:

1. § 5 Sprachvoraussetzungen (zu § 5 AllB) wird wie folgt neu gefasst:

„(1) Da Lernmaterial und Fachliteratur vorwiegend in englischer Sprache vorliegen und einzelne Lehrveranstaltungen auch in englischer Sprache abgehalten werden, sind für das Studium Englischkenntnisse auf dem Niveau B 1 nach dem Gemeinsamen Europäischen Referenzrahmen für Sprachen (GER) erforderlich. Diese sind nachzuweisen durch:

a) das Abiturzeugnis,

b) Oberstufenzeugnisse oder den Nachweis über mindestens vierjährigen Schulunterricht in Englisch,

c) Nachweis über erfolgreich absolvierte Sprachkurse, wobei mindestens 120 Stunden Unterricht nachzuweisen sind,

d) Fachgutachten oder Lektorenprüfungen über Sprachkenntnisse, die durch Auslandsaufenthalte, Universitätssprachkurse oder im Selbststudium erworben wurden,

e) Nachweis über einen UNIcert-Abschluss der Stufe I,

f) Nachweis über einen TOEFL-Test (computerbasierter Score von mindestens 43, schriftlicher Test mit mindestens 550 Punkten) oder

g) einen anderen vom Prüfungsausschuss als gleichwertig anerkannten Nachweis.

Der Prüfungsausschuss entscheidet in Zweifelsfällen über die Erfüllung der Aufnahmevoraussetzungen.

(2) Der Studiengang kann auch in englischer Sprache studiert werden, hierfür sind vor der Einschreibung Englisch-Sprachkenntnisse als Studienvoraussetzungen wie folgt nachzuweisen:

a) durch ein Sprachzertifikat, Niveau GER B2,

b) durch eine an einer Hochschule bestandene Englisch-Prüfung, die nachweislich das Niveau B2 des Europäischen Referenzrahmens für Sprachen bescheinigt und nicht älter ist als zwei Jahre,

c) Nachweis des Zertifikats „UNIcert II“,

d) TOEFL-Test ITB (internet-based Test) mit mindestens 80 Punkten oder IELTS-Test mit mindestens der Wertung 6 im academic test,

e) Nachweis des Abschlusses eines englischsprachigen Bachelor-Studienganges

f) oder durch sonstige geeignete Nachweise von Englischkenntnissen auf dem Niveau GER B2.

g) Über die Anerkennung anderer Sprachnachweise entscheidet der Prüfungsausschuss.“

2. In Anlage 1 werden die folgenden Modulbeschreibungen hinzugefügt:

Chemistry-W27	**Sustainable Materials Chemistry: Energy Materials**	6 CP
Optional Module	Faculty 08 / Chemistry	.

Learning goals: The students can

- describe basics of modern concepts of energy conversion and storage
- discuss aspects of sustainability of materials used in energy technologies
- develop and discuss potential solutions to problems of sustainability

Course content:

- basic electrochemistry (galvanic cells, electrolysis)
- Concepts for batteries (Li-ion battery, metal-oxygen batteries, redox-flow cell)
- Solar cells, LEDs, OLEDs
- Water splitting and fuel cells
- sustainability concepts for energy materials (following the 12 criteria of Anatas)
- General thermodynamic considerations for the energy revolution (energy content of storage materials, energy conversion efficiency)

Semester offered and duration: Each year, 1 semester

Responsible professors or position: Professorship of Inorganic Chemistry, Professorship of Organic Chemistry*

Applicable to following degree programs: M.Sc. Chemistry / Optional Module, „Materials Chemistry“, M.Sc. Material Sciences / Optional Module

Participation prerequisites: none

Course format:	In-class time requirement	Preparation and review time
Lecture	30	45
Practice	30	30
Seminar	15	30
Total:	180 hours = 6 ECTS	

Pre-exam requirements: none

Module exam: Oral examination (20-40 minutes, 50%), presentation in the seminar (20-40 minutes, 50%)

Course and exam language: English

* Prof. Dr. Bernd Smarsly, Prof. Dr. Richard Göttlich

Chemistry-W28	**Introduction to Sustainability**	6 CP
Optional Module	Faculty 08 / Chemistry	.

Learning goals: The students can

- Discuss the different declinations of sustainability on a scientific as well as a socio-economic level
- address the challenges posed by climate changes & global warming, loss of biodiversity, resource depletion, general environmental issues in a holistic and interconnected approach
- perform a critical analysis of current state of the art and literature in the field of sustainability
- address the complexity of sustainability by correlating in a holistic view different aspects and concepts related to apparently far disciplines (e.g. chemistry and economics)

Course content:

To introduce students to the basics concepts of sustainability, starting from an historical perspective and providing different declinations of sustainability (e.g., but not limited to, biodiversity, circular economy, resource depletion, raw materials criticality, climate changes)
To enable students to address, in a holistic and transdisciplinary approach, the complexity and interdependencies underpinning the concept of sustainability and to critically correlate them (e.g. relationships between biodiversity depletion and climate changes/global warming)

Semester offered and duration: Each year, 1 semester

Responsible professors or position: Prof. Silvia Gross (University of Padua)

Applicable to following degree programs: M.Sc. Chemistry / Optional Module, „Materials Chemistry“, M.Sc. Material Sciences / Optional Module

Participation prerequisites: none

Course format:	In-class time requirement	Preparation and review time
Lecture	30	45
Practice	15	30
Seminar	30	30
Total:	180 hours = 6 ECTS	

Pre-exam requirements: none

Module exam: Oral examination (20-40 minutes, 50%), presentation in the seminar (20-40 minutes, 50%)

Course and exam language: English

Chemistry-W29	**Sustainable Organic Chemistry**	6 CP
Optional Module	Faculty 08 / Chemistry	.

Learning goals: The students can

- Correlate sources and available technologies for designing sustainable chemical processes.
- Comprehension of alternative modes of performing chemical transformations.
- Correlate quantitative and qualitative measures to evaluate the sustainable potential of chemical processes.
- Define major sources of biomass and their valorization for useful chemicals and materials.
- Identify and evaluate the environmental parameters of a chemical process.
- Design a sustainable chemical process.
- Analyse the influence of reaction components and isolation procedures on the sustainable parameters of a chemical process.
- Apply advanced laboratory techniques to synthesise new products and develop sustainable processes

- Course content:
- Basic concepts of green and sustainable chemistry and the evolution of the field.
- Overview of alternative modes of activation of chemical reactions (i.e. microwaves, ultrasound, light), their mode of action and use in organic chemistry.
- Principles of photochemistry and photocatalysis for the synthesis of organic molecules.
- Application of mechanochemistry for selective transformation of organic molecules.
- Principles of electrochemistry and their application in organic synthesis.
- Design of flow systems for their application in synthesis.
- Homogeneous and heterogeneous catalysts for the development of green/sustainable chemical processes.
- Valorization of the use of organic solvents and an overview of the development of alternative solvents (new solvents from biomass resources, ionic liquids, deep eutectic salts, water...).
- Biomass as a source of industrial chemicals and an analysis of the sustainable use of biomass for industry.
- Biorefinery concept for valorization of biomass to useful chemicals and materials.
- Basic platform of chemicals from biomass.
- Examples of green chemistry in the pharmaceutical industry.
- Green chemistry metrics for valorization of chemical reactions and processes.
- Quantitative and qualitative evaluation of the environmental potential of chemical processes. Application of green chemistry principles to the design of sustainable chemical processes.

Semester offered and duration: Each year, 1 semester

Responsible professors or position: Prof. Jernej Iskra (University of Ljubljana)

Applicable to following degree programs: M.Sc. Chemistry / Optional Module, „Materials Chemistry“, M.Sc. Material Sciences / Optional Module

Participation prerequisites: none

Course format:	In-class time requirement	Preparation and review time
Lecture	30	45
Practice	15	30
Seminar	30	30

Total:	180 hours = 6 ECTS
Pre-exam requirements: none	
Module exam: Oral examination (20-40 minutes, 50%), presentation in the seminar (20-40 minutes, 50%)	
Course and exam language: English	

Chemistry-W30	**Sustainable Water Treatment**	6 CP
Optional Module	Faculty 08 / Chemistry	.

Learning goals: The students can

- Identify and evaluate impacts of pollutants on water quality
- Correlate sources and available technologies for pollution minimization and control
- Discuss characteristics of different types of advanced oxidation processes
- Analyse influence of process parameters on efficiency of water treatment by advanced oxidation processes
- Correlate degradation mechanisms of water pollutants with biodegradability and toxicity changes
- Assess inhibitory effect of water matrix in practical application of advanced oxidation processes.
- Explain the basics for the selection of materials for membrane preparation, and how to characterize membranes
- Define types of membrane operations and design membrane systems
- Select membranes for specific purposes and to test their main characteristics

Course content:

To introduce students to sustainable technologies for water purification and wastewater treatment, and to develop understanding of related challenges and opportunities.

- Utilise advanced laboratory procedures and instruments for synthesis of new products, create sustainable processes, and solve problems of water, air and soil pollution.
- Apply different analytical techniques, analytical and numerical methods, as well as software tools in creative problem solving of engineering challenges, proposing sustainable technological solutions.
- Optimise complete and sustainable technological processes using analysis and modelling aimed at waste minimization utilising the strategy of the closed cycle manufacturing.
- Independently organise and plan timelines, apply a general methodology for project planning and management in a business environment
- Create a critical analysis, evaluation and interpretation of personal results, and compare them with existing data in scientific and expert literature
- Outline results of independent and teamwork in a written and oral form to non-experts and experts in a clear and coherent way.
- Communicate with the scientific and professional community, as well as society in general in local and international surroundings.

Semester offered and duration: Each year, 1 semester

Responsible professors or position: Prof. Hrvoje Kušić (University of Zagreb)

Applicable to following degree programs: M.Sc. Chemistry / Optional Module, „Materials Chemistry“, M.Sc. Material Sciences / Optional Module

Participation prerequisites: none

Course format:	In-class time requirement	Preparation and review time
Lecture	30	45
Practice	15	30
Seminar	30	30
Total:	180 hours = 6 ECTS	

Pre-exam requirements: none
Module exam: Oral examination (20-40 minutes, 50%), presentation in the seminar (20-40 minutes, 50%)
Course and exam language: English

3. § 14 Inkrafttreten:
„Diese Ordnung in der Fassung des 1. Änderungsbeschlusses gilt ab dem Wintersemester 2022/2023. Bis dahin gelten die bisherigen Bestimmungen fort."

Art. 2
Inkrafttreten

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

Gießen, den 09.08.2022
Prof. Joybrato Mukherjee
Präsident der Justus-Liebig-Universität Gießen