

Master of Science

Battery Materials and Technology

*A comprehensive approach to battery
research and technology*





Set your own focus during your studies. The modules allow you to individually specialise along the entire value chain of batteries with all its diverse scientific and technological challenges.

Batteries are a key technology for the 21st century.

Access to sustainable and renewable energy represents one of the great global challenges of the 21st century. Therefore, electrochemical energy storage, in particular batteries, will be an essential tool for the future. What will be future materials for more efficient batteries, which materials will be more sustainable for our environment? How we can make batteries safer and produce them cheaper?

The Master's degree programme *Battery Materials and Technology* prepares its students for these future challenges. It is taught in English and is focused on the natural sciences. However, students can participate in modules from the sister programme *Batterietechnik* which is taught in German and has a strong engineering background.

Both programmes address the fundamental and applied questions of energy storage and provide qualifications that are currently in very high demand on the job market.



At the Bavarian Center for Battery Technology (BayBatt), the University of Bayreuth researches and develops smart, networked, and sustainable energy storage systems, such as batteries in electric vehicles, buildings, and grids – i.e. mobile as well as stationary applications.

Develop the next generation of batteries.

A current estimate for the global demand of batteries for electric vehicles, stationary storage, and consumer electronics assumes an enormous increase by 2030. This growing demand is leading to a massive expansion of production capacities throughout Europe and around the world, requiring many more highly-qualified specialists with the necessary battery know-how for the entire value chain: from the electrode and separator materials to the battery pack in the electric car.

These are excellent prospects for you, because your Master's degree equips you for exciting tasks in industry and science. If you choose to pursue a PhD degree afterwards, you will benefit from the close connection to the *Bavarian Center for Battery Technology (BayBatt)* where the University of Bayreuth is conducting intensive research ranging from battery materials and analytics to smart, networked, and sustainable energy storage systems for the future.

Combine integrative thinking and specialization.

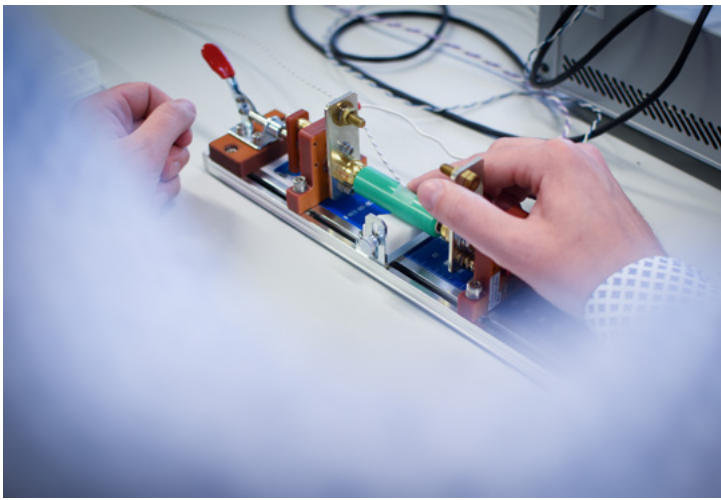
Interdisciplinarity is a trademark of the University of Bayreuth, and it is reflected in the *Battery Materials and Technology* degree programme. To get a well-founded understanding of battery technology, you will first acquire basic knowledge of Chemistry, Materials Science and Electrical Engineering. You can then expand your knowledge in areas that particularly interest you. You will gain experience in research and laboratory practicals, and put your knowledge into practice in the advanced seminar while always remaining in close contact with battery research in the field. The master's thesis will complete your studies. The interdisciplinary concept offers another advantage: you have two degree programmes to choose from! While the *Battery Materials and Technology* degree programme has a clear focus on the natural sciences, the sister degree programme *Batterietechnik* has an engineering orientation. It is possible to switch between the degree programmes.

Your degree programme at a glance –
4 semesters duration

Individual Alignment Modules	ECTS*
Fundamentals of mathematics for electrochemical energy storage systems	5
Fundamentals of physics for electrochemical energy storage devices	5
Fundamentals of inorganic chemistry for electrochemical energy storage systems	5
Fundamentals of physical chemistry for electrochemical energy storage systems	5
Fundamentals of macromolecular / organic chemistry for electrochemical energy storage systems	5
Fundamentals of electrical engineering for electrochemical energy storage systems	5
Fundamentals of materials science for electrochemical energy storage systems	5
Fundamentals of signals and systems for electrochemical energy storage systems	5
3 alignment modules must be taken	15

Mandatory Modules	ECTS*
Battery systems technology 1	5
Battery materials 1	5
Electrochemistry 1	5
Battery systems technology 2	5
Battery materials 2	5
Electrochemistry 2	5
Seminar	5
	35
Compulsory Elective Modules	ECTS*
Natural Science	
Electrochemistry	5
Operando-Analytics of electrochem. energy storage	5
Inorganic active materials f. electrochem. energy storage	5
Polymer materials for electrochemical storage	5
Physical Chemistry	5
Inorganic Chemistry	5
Macromolecular Chemistry	5
Theoretical Physics	5
Inorganic colloids for electrochemical energy storage	5
2 compulsory elective modules must be taken	10
Engineering Science	
Electronics for electrical energy storage	5
Systems engineering for electrical energy storage	5
Electrode design for electrochemical energy systems	5
Electrical energy systems	5
Functional materials	5
Materials process engineering	5
Methods of battery management	5
Business & information systems engineering and networked energy storage systems	5
1 compulsory elective module must be taken	5
Research Modules	ECTS*
2 Research Modules	2 x 10
Research Plan	5
	25
Master thesis	ECTS*
Master thesis	30
TOTAL	120

*Credit points according to ECTS. The awarding of credit points (LP) according to the European Credit Transfer System (ECTS) supports the international comparability of academic achievements at European universities.



Once all students reach the required level of knowledge, they complete the interdisciplinary modules “Battery Materials” and “Battery Systems Technology” to gain a holistic understanding of the battery. They will also deal intensively with the electrochemistry of batteries.

Why you should study in Bayreuth.

Together with the German-language degree *Batterietechnik*, the *Battery Materials and Technology* degree programme is unique in Europe and benefits from its close link to the *Bavarian Center for Battery Technology*. The University's central research institute combines battery-specific know-how and drives the interdisciplinary research and development of battery storage systems. It maintains close contact between research and teaching at the interfaces of physics, chemistry, materials science, engineering, information technology and economics.

You can expect a varied and intensive course of study, state-of-the-art equipment, and a personal atmosphere between students and lecturers.

Our Welcome Service supports international students with all questions regarding life in Germany, for an excellent start to their studies at the University of Bayreuth.



Our campus is the heart of the University. This is where friendships begin, collaborations start, and ideas take life. There is also a wide range of activities, such as film screenings, art exhibitions, theatre performances, music events, the annual UniOpenAir and much more.

Study conditions that achieve top marks in the rankings.

The University of Bayreuth has around 13,500 students. It is characterized by its friendly campus. Walking distances are short, and you will quickly get to know students from other disciplines. In national and international rankings, the University of Bayreuth regularly receives top ratings in terms of student support.

Student life promises great variety even outside the lecture halls. You can get involved in a variety of student organisations or take advantage of the extensive range of university sports. There are also regular film screenings, art exhibitions, theatre performances, numerous music events, and the annual Uni OpenAir on campus.

In addition, the City of Bayreuth offers good housing at reasonable prices and a low overall cost of living. The leisure activities in town, in the Fichtelgebirge mountains, and the Franken Jura are also extremely attractive.

An attractive degree programme awaits.

We appreciate your interest in the master's programme *Battery Materials and Technology* at the University of Bayreuth. You can enrol for the winter or summer semester. For admission, you need a bachelor's degree in a natural science or engineering subject. Basic knowledge of mathematics and physics is essential, as is basic knowledge of general chemistry. Suitable applicants will take part in a selection procedure.

Programme Moderator

Prof. Dr. Matteo Bianchini

Chair of Inorganic Active Materials for Electrochemical Energy Storage

Bavarian Center for Battery Technology (BayBatt)
University of Bayreuth
95440 Bayreuth

Any more questions?

Dr. Maike Brütting

Bavarian Centre for Battery Technology (BayBatt)

Phone: +49 (0)921 55-4907

baybatt@uni-bayreuth.de

More information

www.uni-bayreuth.de/en

www.baybatt.uni-bayreuth.de/en

www.uni-bayreuth.de/en/master/battery-materials-technology

