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Master's degree

MSc Medical Photonics
Friedrich Schiller University Jena • Jena

Overview

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<th>Degree</th>
<th>Master of Science Medical Photonics</th>
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<tr>
<td>Teaching language</td>
<td>English</td>
</tr>
<tr>
<td>Languages</td>
<td>All courses are held in English. Participants are expected to write protocols, exams and the Master's thesis in English.</td>
</tr>
<tr>
<td>Programme duration</td>
<td>4 semesters</td>
</tr>
<tr>
<td>Beginning</td>
<td>Winter semester</td>
</tr>
<tr>
<td>More information on beginning of studies</td>
<td>Pre-courses in mathematics and chemistry start at the beginning of October. The actual MSc programme begins in the middle of October.</td>
</tr>
<tr>
<td>Application deadline</td>
<td>1 April to 15 July for the following winter semester</td>
</tr>
<tr>
<td>Tuition fees per semester in EUR</td>
<td>None</td>
</tr>
<tr>
<td>Combined Master's degree / PhD programme</td>
<td>No</td>
</tr>
<tr>
<td>Joint degree / double degree programme</td>
<td>No</td>
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</tbody>
</table>

Description/content

Understanding the cause of diseases, facilitating an early diagnosis, and providing a specific effective treatment are the goals of modern medicine. Light plays a key role in turning this ambitious vision into reality. In biomedical research, modern optical and photonic techniques allow for monitoring and manipulating life processes in cells and tissues on a molecular level. But also in clinical practice, optical and photonic techniques are well established in many fields of medicine, like in ophthalmology, endoscopy or biomedical imaging.

To meet the demand for scientists trained in the interdisciplinary field of medical photonics, the Faculties of Medicine, Chemistry and Earth Sciences, and Physics and Astronomy of the Friedrich Schiller University Jena decided to establish conjointly the MSc Medical Photonics programme. It conveys basic and advanced insights into the quickly developing field of medical photonics. It is targeted at students holding a Bachelor of Science degree in physics, chemistry, biochemistry, and biology, but also at medical doctors and students of medicine. It provides students of these disciplines with the necessary training in the neighbouring disciplines and offers a comprehensive
cross-disciplinary study programme. The aim of the programme is to provide all students with the necessary knowledge and practical skills to use and develop optical/photonic tools for biomedical research and clinical applications.

Although the interdisciplinary training of students in medicine, life sciences, physics, and chemistry is a central goal of this programme, it is at the same time a big challenge. Since students with different knowledge and skills have to be taught, adjustment modules offered in the first year of the programme aim at complementing the students' knowledge in the neighbouring disciplines. Additional modules give all students training in fundamental techniques, such as programming, statistics, and image processing. Elective courses in the second and third semesters allow the student to focus on topics in which they are interested and to gather all the skills to work on the Master's thesis, which will be concluded in the fourth semester. You can find more details on the programme website.

### Course Details

**Course organisation**

The curriculum has a modular structure. Credit points are granted according to the European Credit Transfer System (ECTS) for every successfully completed module. The individual modules are grouped into five "blocks".

- Modules of the block "Adjustment" offered in the first and second semester of the Master's programme aim at complementing the student's knowledge in the neighbouring disciplines.
- Modules in this block impart knowledge in mathematics, physics, physical chemistry, spectroscopy, and human biology.
- Additional modules within the block "Fundamentals" give the students training in basic skills such as programming, statistics and image processing. These skills are fundamental to all of the other modules. Modules of this block also give an introduction to biomedical imaging techniques.
- Elective courses can be selected in the second and third semester. Modules within the block "Specialisation" allow students to focus in more depth on special topics of Medical Photonics, such as microscopy (biological microscopy, single-molecule microscopy, electron microscopy, nanoptics, labels for biological specimens), spectroscopy, and diagnostics (microspectroscopy, chemometrics, optical sensors, microfluidics, mass spectroscopy) as well as clinical applications (ophthalmology, medical diagnosis and therapy, theranostics, biomaterials) and important tools in Medical Photonics (lasers, optical fibres). Furthermore, students interested in mathematics and informatics will have the possibility to enhance their skills in additional modules (e.g., advanced mathematics, image understanding, visual recognition and analysis, management of scientific data).

Lectures and seminars are accompanied by practical courses. In the first and second semester, a practical lab course allows students to put the theory into practice. During this course, students can carry out experiments in set-ups located in the departments of physics, physical chemistry, and physiology. During the third semester, a research-oriented practical course provides the possibility to participate in a current research project of one of the research groups participating in the Master's degree programme and introduces the student to the topic of his/her Master's thesis, which will be concluded in the fourth semester (a detailed description of the course organisation can be found here). You can find more details on the programme website.

**Types of assessment**

In general, each of the modules of the Master's programme is concluded with an oral or written exam. In addition to this, students are required to give presentations in some modules. A written report is mandatory in practical modules. All requirements that need to be fulfilled to earn the credit points given for each module are listed in the module catalogue available on the programme's website.

The overall grade for the Master's programme is a combination of the module grades and the grade of the Master's thesis.

**A Diploma supplement will be issued**

Yes

**Integrated internships**

A research internship is supposed to be completed during the third semester. It gives students the possibility to apply the knowledge and skills acquired during the first two semesters of the Master's
Programme to a specific research project by working in a research laboratory of their choice. Depending on the students' interests and the approval of the examination board, the research internship and the practical work for the Master's thesis can also be realised in one of the research-oriented companies in Jena.

<table>
<thead>
<tr>
<th>Course-specific, integrated German language courses</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course-specific, integrated English language courses</td>
<td>No</td>
</tr>
<tr>
<td>The course of study can be taken entirely online</td>
<td>No</td>
</tr>
<tr>
<td>Digital learning and teaching modules</td>
<td>Video learning</td>
</tr>
</tbody>
</table>

**Description of e-learning elements**
Friedrich Schiller University Jena provides teachers with the e-learning environment MOODLE (Modular Object-Oriented Dynamic Learning Environment), giving lecturers, among others, the opportunity to provide video-assisted teaching, e.g., in an inverted classroom. MOODLE is used in different modules of the Master's programme Medical Photonics.

| Participation in the e-learning course elements is compulsory | No |
| Can ECTS points be acquired by taking the online programmes? | No |
| Can the e-learning elements be taken without signing up for the course of study? | No |

**Costs / Funding**

<table>
<thead>
<tr>
<th>Tuition fees per semester in EUR</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester contribution</td>
<td>Semester fee (student services and student self-government), including semester ticket for free use of public transport: approx. 220-230 EUR per semester and a one-off fee of 20 EUR for a multifunctional student ID card (“Thoska”)</td>
</tr>
<tr>
<td>Costs of living</td>
<td>Students need approx. 700 EUR per month for rent, food, health insurance, books, and personal items.</td>
</tr>
<tr>
<td>Funding opportunities within the university</td>
<td>No</td>
</tr>
</tbody>
</table>

**Requirements / Registration**
**Academic admission requirements**

Applicants must have a Bachelor of Science degree or a comparable academic qualification in chemistry, physics, biology, biochemistry/molecular biology, or closely related fields. Students of human medicine must have concluded their studies with a state exam. In order to gain admission, the Bachelor's degree should have been concluded with the grade "good" (equal to at least 2.5 in the German grading system). See the [programme website](https://www.uni-jena.de/en) for details.

**Language requirements**

Although applicants are not required to provide proof of their English skills, proficiency in English language is required as all modules are taught in English only.

**Application deadline**

1 April to 15 July for the following winter semester

**Submit application to**

Please, submit your application via the website of the Master Service Centre:

[https://www.uni-jena.de/en/Masters_application.html](https://www.uni-jena.de/en/Masters_application.html)

After having entered the necessary information, an automatically generated application form should be signed and sent by mail to:

Friedrich-Schiller-Universität Jena
Master Service Centre
07737 Jena
Germany

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**Services**

**Possibility of finding part-time employment**

Although students should dedicate most of their time to the MSc programme, it is in principle possible to find part-time employment. Students from the European Union, Iceland, Liechtenstein, Norway, and Switzerland have unrestricted access to the German labour market. For international students from other countries, special legal regulations apply for obtaining a work permit.

**Accommodation**

Around 7,400 rooms are available in student residences, which are administered by the "Studierendenwerk Thüringen" (see the website [http://www.stw-thueringen.de/english/housing/wohnen.html](http://www.stw-thueringen.de/english/housing/wohnen.html) for further information). Due to limited capacity, an early application is recommended. Alternatively, students can also look for single or shared private accommodation on their own. Further information on finding a room or shared apartment is provided by the International Office of the university.

**Specific specialist or non-specialist support for international students and doctoral candidates**

- Welcome event
History of the University

In 2008, the Friedrich Schiller University Jena celebrated its 450th anniversary. It was founded as an academic school by Prince-Elector Johann Friedrich the Magnanimous of Saxony in 1548. It was raised to the status of a university by Emperor Ferdinand I in 1557 and opened as such in 1558.

Instead of an outline of the university’s history, here are some facts:

- In 1663, Gottfried Wilhelm Leibniz was a student of the scientist Erhard Weigel in Jena.
- Friedrich Schiller was a professor of history at Friedrich Schiller University Jena between 1789 and 1799.
- At the same time Johann Wolfgang von Goethe, then State Minister of Saxe-Weimar, supported Friedrich Schiller University Jena extraordinarily. He spent a lot of time in Jena.
- Jena was the centre of classical German philosophy, hosting among others: Johann Gottlob Fichte (1794-1799), Friedrich-Wilhelm Joseph Schelling (from 1798), Georg Wilhelm Friedrich Hegel (1805-1807).
- Numerous renowned German poets, writers and dramatists studied at Friedrich Schiller University Jena (Johann Christian Günther, Friedrich Gottlob Klopstock, Matthias Claudius, Friedrich Hölderlin, Novalis, Julius Mosen, Clemens Brentano, Gerhard Hauptmann, Kurt Tucholsky).
- World-famous pedagogues such as Christian Gotthilf Salzmann, Friedrich Wilhelm August Fröbel, Peter Petersen (Jenaplanschule) studied or taught in Jena.
- Johann Wolfgang Doebereiner (Professor of Chemistry, 1810-1849) was the first to organise the chemical elements by means of "triads".
- Ernst Haeckel (Professor of Zoology, 1834-1909) was the most distinguished representative of evolution theory in Germany.
- The physicist Hans Busch (Professor of Applied Physics, 1922-1947) worked on electron optics and developed the basic principles of electron microscopy.
- The Jena psychiatrist and neurologist Hans Berger (professor, 1906-1938) developed the diagnostic method of electroencephalography (EEG).
- The optician and mechanic Carl Zeiss, the physicist Ernst Abbe and the glass chemist Otto Schott formed an impressive collaboration at the end of the 19th century, a unique example of cooperation between science and industry that has been shaping the profile of scientific research at Friedrich Schiller University Jena to this day.

Today the Friedrich Schiller Friedrich Schiller University Jena is a university on the move. With about 18,000 enrolled students, it is one of Germany’s fastest growing universities. Despite the fact that the number of students has quadrupled since 1989, the university is not overcrowded. More than 2,000 lecturers and researchers ensure quality teaching and training commensurate with a classic university. In addition, more than 1,300 scientists and technical staff work on research projects financed by outside sponsors.
University location

The city of Jena
The city of Jena is brought to life by its fascinating combination of an intellectual history, a delightful countryside, an innovative international research and industry, and a youthful student lifestyle. This rich variety creates a unique backdrop which lends this small, lively city its special charm. Watch the video at: http://tinyurl.com/poo956v

Jena's academic and intellectual development
Jena has been one of the most famous places to study in Germany since the founding of its university, the "Alma Mater Jenensis", in 1558. At the end of the 18th century, thanks to its close connection to the nearby royal seat at Weimar and support by the poet and minister, Goethe, the city on the Saale went through its classical period, during which it developed into the most important intellectual centre in Germany.

Jena's economic development
In the second half of the 19th century, Jena developed into an industrial city, thanks to the work of the three scientific and economic giants, Carl Zeiss, Otto Schott, and Ernst Abbe. Their cooperation led to the creation of the world-famous Zeiss Works and the "Schott und Genossen" glass factory. This effective cooperation between research institutes and economic enterprises has proven its value all the way up to the present day and justifies Jena’s exceptional reputation as a high-technology location.

Jena's modern cultural scene
In addition to museums of technology, science, literature, and art history, there is also an attractive modern cultural scene in Jena. For example, the annual open-air festival "Kulturarena" attracts international stars to Jena. Furthermore, there are plenty of individual, top-class events among the wide range of performances at Jena Theatre (Theaterhaus), Jena Art Society (Kunstverein), and Jena Philharmonic Orchestra.

Jena's countryside
The traditional, innovative city lies at the middle reaches of the River Saale. The Saale valley in Jena is shaped by a host of monuments to its cultural history and has connections with many great names from the past. Along with its many sights, the city, nestled in an almost Mediterranean landscape with limestone hills up to 400 metres high, boasts a variety of bicycle paths and charming surroundings for walking and all other sporting activities, such as triathlons, dragon boating, cycling, track, marathons, martial arts, etc.

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