INTERNATIONAL STUDY PROGRAM

MASTER
Electrical and Microsystems Engineering
Congratulations! The successful completion of your degree programme course opens the way to postgraduate studies and a secondary university degree. The information in this flyer should help make your choice a little easier. However there is no substitute for a personal consultation, and you are warmly invited to come and talk to our faculty staff on campus. The main aim of our Master degree programmes is to deepen, specialise and build on the knowledge and skills you have previously acquired in your academic studies. You will find the course to be either more research or application oriented, depending on its content structure.

You can be confident that OTH Regensburg, with its excellent reputation both in Germany and internationally, will provide the right environment for your studies. And if you are not already in love with the beautiful city of Regensburg, it is sure to charm you on your first visit here!

I would be delighted to welcome you here as a new student!

Prof. Dr. Wolfgang Baier
President of OTH Regensburg
YOUR CAREER STARTS HERE!

Are you aiming for a more valuable position in industry or civil service? Do you require interdisciplinary skills for your current profession? Do you want to have the possibility to expand your knowledge by part-time studies? Are you interested in a scientific career or a doctorate? Then you will certainly be interested in our interdisciplinary degree program „Master of Electrical and Microsystems Engineering“.

This master program is being offered at OTH Regensburg as a postgraduate study course by the faculties of Electrical Engineering & Information Technology and General Sciences & Microsystems Engineering. The interdisciplinary cooperation and the modular design of the master program provides you with a multitude of options to fine-tune the program to your professional needs.

Aside from expanding your technical knowledge, you will gain experience in methodological and social competences – skills that are a vital part of the work environment of today’s executive managers. With this master program you will build a solid foundation for your future professional career!

Prof. Dr. Oliver Steffens
Dean of the Faculty of General Studies & Microsystems Engineering

Prof. Dr. Michael Niemetz
Dean of the Faculty of Electrical Engineering & Information Technology
Your Career Starts Here!
International „two degree“ programme

Our Master degree programme places a strong focus on electronics and semiconductor technology. It provides a solid theoretical background as well as a minimum of 6 months internship in one of our international partner companies (e.g. Infineon Technologies and Osram Opto Semiconductors) in Germany or abroad. Besides the classic master programme there is the possibility of a twin degree.

This twin degree programme offers you the opportunity to obtain an accredited European Master degree from OTH Regensburg (Germany) in combination with a Master degree from Malaysia (USM Penang or UTAR Kampar) simultaneously. This programme is supported by German Academic Exchange Service (DAAD), therefore some students are offered scholarships.

The course is structured to enable students to work independently, efficiently and responsibly using scientific methods and problem-solving techniques.

Aside from conveying technical expertise, the course is designed to build personalities and leadership knowledge and skills.

Graduates will be equally proficient in performing technical tasks and leadership roles.

Lectures in Germany or abroad: min. 12 months (min. of 6 months in Germany)
Master thesis in Germany or abroad (usually in a company): min. 6 months
STUDY CONTENT

The „Master of Electrical and Microsystems Engineering (MEM)” is available as an interdisciplinary Master degree programme, which has been offered by the faculties of Electrical Engineering & Information Technology and General Sciences & Microsystems Engineering since 2002. Course options include full time, part time and dual study. The Dual Master offers further opportunities for practical experience to gain excellence in industry and builds a solid foundation for your future professional career.

Thanks to the cooperation of OTH Regensburg with two Malaysian universities, students can study in both, Germany and Malaysia. MEM can now also be studied entirely in English.

A special focus is placed on sensor technology, electronics and optoelectronics. These are areas of particular importance to our region, as Regensburg has been chosen as the focal point of sensor technology in Bavaria. This is not surprising given the number of jobs for highly skilled employees within this sector in and around Regensburg.

In 2003, our cleanroom laboratory, unique in Bavaria, was opened at OTH Regensburg, providing a state-of-the-art environment for studying methods and technologies used in today’s semiconductor industry.
OTH REGENSBURG

STUDY OPPORTUNITIES

Full time
(since 2002)
3 semesters

Part time
(since 2002)
6 semesters accompanying full time employment

DUAL
(since 2013)
4 semesters including internship
in a company in Germany or abroad

APPLICATION PERIOD

Winter semester
1 May – 15 Jun

Summer semester
15 Nov – 15 Jan

APPLICATION PROCESS

Application at OTH Regensburg

Selection interview at OTH Regensburg or partner university abroad

Confirmation of OTH Regensburg

Start of the Master programme

www.oth-regensburg.de/en/studienbewerbung
MODULE OVERVIEW  OTH REGENSBURG

Master of Engineering (Electrical and Microsystems Engineering)

Foundation module catalogue
Foundation module 1 (compulsory)
Advanced Engineering Mathematics (MM)
Foundation module 2 (select one module)
Micromechanics (MT)
Selected Topics of Electronics (AKE)
Optoelectronics (SO)
Foundation module 3 (select one module)
Chemistry for Master Students (CMA)
Digital Design (DT2)
Laser Technology and Photonics (LT)
Foundation module 4 (select one module)
Solid State Physics (FK2)
Microcontrollers (MC)
Technical Optics – Microoptics (TOM)

Consolidation module catalogue
Consolidation module (select four modules)
Advanced semiconductor technology (VHT)*
LED Technology (LED)
Wet Chemical Processes
in Semiconductor Manufacturing (HC)
Advanced Packaging (AP)
Laser Material Processing (LMP)
Electronic Product Engineering (EPE)
Advanced LabVIEW Programming Techniques
with the use of Mindstorms NXT (LAV)
Quantum Theorie (QT1)
Quantum Theorie (QT2)
Engineering Electromagnetics (ED)
Physics of Semiconductor Devices (BEP)
Advanced Microcontroller Techniques (VMC)
Programmable Logic Devices (PLB)
Electromagnetic compatibility (EMV)
RF Circuit Design (HFS)
Special aspects of renewable energy (SRE)
Embedded Linux (ELX)
Cybernetics (CYB)
Optical Fiber Technology (OFT)
Multiprocessor and Multicore Designs for
Reliable Embedded Systems
Master Optoelectronics Projects using LabVIEW
Analog/Digital- and Digital/Analog-Converter

Interdisciplinary module catalogue
(select one module)
Business Studies for Engineers
„Engineers as Entrepreneurs“ supplementary course (ZIU)
„Technical Sales“ supplementary course (ZTV)
Project Management (PM)
Additional: Safety Officer
Safety Engineer (ZFA)
International Empowerment
Scientific Basis of Intercultural Empowerment (WGH)
Analysis of Culture-related Conflict Situations (AK)
Culture Difference and Intercultural Action (KD)
Recognising and Nurturing Intercultural Empowerment (IHE)
Quality and Reliability
Advanced Methods of Quality Management (FQM)
Safety and Reliability of Systems (SZS)
Statistics and Operations Research
Probability, Statistics and Stochastic Processes (WST)
Design of Experiments, DoE (VM)
Operations Research (OR)
International Research Methodology and Communication
English for Master Students (German for Intern. Students)
Research Methodology
Project Management

Project work
Project work
Project work (PA)

Master thesis
Master thesis
Written scientific thesis
Disputation

All subjects marked in red are offered in English language.
*) see page 11
TWIN DEGREE PROGRAM UTAR AND OTH REGENSBURG

Master of Engineering (Electronic Systems)
Master of Engineering (Electrical and Microsystems Engineering)

Lectures to be taken at UTAR

Core
Electromagnetic Compatibility
Electronics Reliability
Microelectronic Materials
Research Methodology
Project
Project Management

Elective 1 (select one only)
Microsystems Design & Technology
Design Patterns for Embedded Systems
VLSI Design
Optics

Electives 2 (select two only)
Micro-fabrication technology
Optoelectronic devices
Analogue CMOS Integrated Circuits Design
Advanced Mathematics

Lectures at OTH Regensburg

Foundation modules
Foundation Module 1
(alternatively: Math 1 + 2 at UTAR)
Foundation Module 2
Foundation Module 3
(alternatively: Optics at UTAR)
Foundation Module 4
(alternatively: Microelectronic Materials at UTAR)

Consolidation modules
4 Consolidation modules out of the
Module catalogue of OTH Regensburg or
of the Module catalogue of UTAR (Elective 1 + 2)

Interdisciplinary module
International Research Methodology
and Communication
Project Management (UTAR)
Research Methodology (UTAR)
English for Master students
(German for international students)

Project Thesis

Master Thesis
(handed in at OTH Regensburg and UTAR)

Intakes

January (UTAR)
March (OTH Regensburg)
May (UTAR)
October (OTH Regensburg)
## TWIN DEGREE PROGRAMME

### USM AND OTH REGENSBURG

(for OTH Regensburg students)

- Master of Engineering (Electrical and Microsystems Engineering)
- Master of Science (Solid State Physics)

<table>
<thead>
<tr>
<th>Summer semester</th>
<th>OTH March – August</th>
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<tbody>
<tr>
<td>Mathematics for Master</td>
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<tr>
<td>Technical Optics – Microoptics (TOM)</td>
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<td>Electronic Product Engineering</td>
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<td>Project Thesis</td>
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<td>English Language</td>
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<th>Winter semester</th>
<th>USM September – January</th>
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<td>Solid State Physics Theory</td>
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<td>Semiconductor Physics</td>
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<td>X-ray Structure</td>
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<td>Measurements &amp; Experimental Techniques 1</td>
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<th>Summer semester</th>
<th>USM February – June</th>
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<tr>
<td>Physics of Optic Communication</td>
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<td>Semiconductor Devices</td>
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<tr>
<td>Measurements &amp; Experimental Techniques 2</td>
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<td>Bahasa Language</td>
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### USM AND OTH REGENSBURG

(for USM students)

- Master of Science (Solid State Physics)
- Master of Engineering (Electrical and Microsystems Engineering)

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<td>Master Optoelectronic Project in Labview</td>
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<td>Project Thesis</td>
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<th>Winter semester</th>
<th>OTH October – February</th>
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<tr>
<td>Optoelectronics</td>
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<tr>
<td>Laser Technology and Photonics</td>
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<td>Laser Materials Processing or Cybernetics</td>
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<td>German Language</td>
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### MT MAL or GER

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<th>MT MAL or GER October – March (6m)</th>
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ADVANCED SEMICONDUCTOR TECHNOLOGY
CONSOLIDATION MODULE AT OTH REGENSBURG

Consists of several sub-modules:

- Modern epitaxy: research/industry and semiconductor heterostructures
  (Dr. Tonkikh, Osram Opto Semiconductors)
  course during semester
- Physics of Semiconductor Devices – an Introduction (Dr. Ploss, Texas Instruments)
  Block course one week
- Solid Waves (Ebbecke, Osram Opto Semiconductors)
  course during semester
- Introduction to Microfabrication and Nanotechnology (Dr. She, Sun Yat-sen University, China)
  Block course one week
- Optical Characterization of Advanced Semiconductor Materials and Nanostructures
  (Dr. Sherstyuk, Moscow Technological University MIREA)
  Block course one week
- Introduction to Nanomaterials (Prof. Dr. Rajkumar Durairaj, Universiti Tunku Abdul Rahman, Malaysia)
  Block course one week

In order to attend the module Advanced Semiconductor Technology:

- Choose any 2 sub-modules from the list
- Register for the exam of the 2 sub-modules during attending them
- The two grades of the sub-modules will be combined and you will get one
  combined grade for the module Advanced Semiconductor Technology

Advanced Semiconductor Technology has 5 ECTS and 4 SWS
EXCELLENCE IN RESEARCH

EXAMPLE OF A RESEARCH PROJECT: PROF. DR. GARETH MONKMAN

Because of the low breakdown voltage (3000V/mm), energy densities of electrostatic systems are very limited compared to their electrodynamic counterparts. At microscales however, breakdown voltages increase with decreasing size which is why most MEMS are electrostatic and not electrodynamic. The same rules apply to electroadhesion making electrostatic microgrippers extremely effective. Furthermore, as a surface-only force, electroadhesion is ideally suited to the handling of delicate micro-optical components such as microlenses and surface coated filters.

Magnetoactive elastomers are suspensions of soft or hard magnetic particles embedded in a soft polymer matrix. On the application of a magnetic field strength of under 500 mT, the elastomer undergoes an increase in elastic modulus which can exceed 1,000,000%. This is of particular interest in biomedical...
applications, and in particular tissue engineering, where cell growth is positively influenced by a hard surface. Being polymers it is possible to form exact structures as desired.

Acoustic stimulation is an established method for growth acceleration of chondrocytes in tissue engineering. However, uncertainty as to the optimum parameters (frequency, pulse width etc.) remains to be investigated, and a new acoustic driver with adjustable parameters has been developed for this purpose. In addition, the determination of absorbed acoustic energy is paramount. Further research is continuing in the development of a new form of cost effective ultrasound measurement.

Ultrasound power amplifier schematic.

During a large EU project with 7 European partners a robotic system for the automated cleaning and inspection of large free field solar parks was developed. The robot hangs from the solar panel frames and propels itself by means of two independent prime movers. These are synchronised to allow inclined motion for the removal of hard debris and also, in conjunction with tilt sensors, to enable orientation correction following path deviations due to staggered solar panels.

At the top: Structured magnetoactive elastomer matrix.

Below: Cleaning and inspection robot undergoing trial on a 100 kW photovoltaic free field site in Castuera, Spain.
At the top: Packaged MEMS-based thermal conductivity vacuum gauge with electronics and a vacuum flange.

Below: Gas-sensitive filament of a miniaturised thermal conductivity vacuum gauge.

**EXCELLENCE IN RESEARCH**

**EXAMPLE OF A RESEARCH PROJECT:**

**PROF. DR. RUPERT SCHREINER**

The pressure regime in vacuum applications covers several orders of magnitude, so pressure measurement requires the use of vacuum gauges that are based on different physical principles. Common principles use the thermal conductivity or the ionisation ability of the residual gas.

The measurement range of thermal conductivity vacuum gauges can be extended by a miniaturisation of the heated, gas-sensitive structure. Such miniaturised gauges are also suitable for pressure monitoring in sealed devices.

Ionisation gauges use hot cathodes to emit electrons that are necessary for the ionisation of the residual gas. The performance of these gauges can be improved by using electron sources that are based on cold electron emission, so called field emission. The high electric field strength that is necessary for field emission can be achieved by microscopic sharp tips.

MEMS-based extraction grid for electron acceleration in ionisation vacuum gauges.

Microscopic sharp tips made of silicon that can be used for field emission cathodes.

At the top: Packaged MEMS-based thermal conductivity vacuum gauge with electronics and a vacuum flange.

Below: Gas-sensitive filament of a miniaturised thermal conductivity vacuum gauge.
Double Degree students in Malaysia and Germany

TK Ming

TK, how long have you been in Germany and how did you like it?

Germany was a great experience for me. I came as a double degree student of UTAR to OTH Regensburg and stayed for over 1 year. The first six month I completed courses in the Master programme Electrical and Microsystems Engineering at OTH Regensburg and in the next 9 month I went for an internship and my Master’s thesis to Osram. This was a great experience, as in Malaysia we normally only have 3 months internships and gave me the opportunity to do a research project at a company.

I just returned to Malaysia now and I have two Master’s degrees and a lot of practical experience. I hope to get a job at Osram in Malaysia, which hopefully give me the opportunity to have a successful career and return to Germany often.

Manuel Binder

Mr. Binder, how long have you been in Malaysia and how did you like it?

I came to Malaysia for 1 year as a double degree student of OTH Regensburg and Universiti Tunku Abdul Rahman (UTAR).

Malaysia is a scenic, fascinating and incredibly diverse country. The influences of the three ethnic groups – Malays, Chinese and Indians – are reflected in every aspect of every-day life. Because of the different ways of thinking and approaches of the local population, in dealing with everyday situations, I often experience new and interesting conversation situations.

I was especially impressed by the diversity of the Malaysian cuisine. For the people in Malaysia the food is highly important. In almost every city there is a particular dish or speciality.

The cost of living for me as a student were pleasantly low, so that there is still budget left for the travelling in Malaysia and the surrounding countries. The beautiful landscape and the friendly people in Malaysia and in the region impressed me.

I felt very well in my role as a student in Malaysia, but also as a foreigner. The people I have met are curious, interested and always friendly in a natural way.
REGENSBURG –
AN EXCELLENT DECISION

When deciding to study in Regensburg you are making an excellent choice in many aspects. You are choosing a city full of history, a UNESCO world heritage site with 2000 years of history. But Regensburg does not only tell history, you are actively involved in that history – you can see, feel and enjoy it.

When deciding to study in Regensburg, you are deciding to stay in one of the most dynamic and innovation oriented research and business areas in Germany. High Tech global players like BMW, Continental Automotive, OSRAM or Infineon Technologies and many of our world famous German SME (small and medium sized enterprises) open opportunities to get in contact with Germany’s high tech industry during your studies.

When deciding to study in Regensburg, you are deciding to enjoy a young and vital city. More than 30,000 students from different regions and countries make it easy to be part of a big and open minded community.

When deciding to study in Regensburg, you are choosing excellent conditions of studying and an excellent Technical University of Applied Sciences, where you can easily profit from the German high-end education system and a close cooperation between Science and Industry.

Choose Regensburg – an excellent starting point for your scientific and professional career.

Dieter Daminger
Councilor for Economic, Financial and Research Affairs City of Regensburg
REGensburg

UNESCO World Heritage Site

Atmosphere and Quality of Life.
Located in the heart of tropical southeast Asia, Malaysia has a growing higher education sector and plenty to offer for those considering postgraduate study abroad.

Malaysia can certainly be described as a land of opportunity. This culturally and geographically diverse country, separated by the South China Sea, is quickly evolving into a technologically-advanced, industrialised nation.

Affordable course fees and a relatively low cost of living are just a few of the many reasons graduates decide to further their education in Malaysia. With its welcoming multi-ethnic population and beautiful natural landscapes providing a fascinating contrast to modern city living, you will feel safe and at home here as you study for your internationally-recognised qualification.

With its world-class education system and strong international reputation, Malaysia is an increasingly popular study destination for international students interested in education abroad. Malaysia has about 70,000 international students from more than 100 countries studying in private schools, international schools, colleges, private universities, foreign universities branch campus and public universities.
COOPERATION PARTNERS

USM
USM offers courses ranging from Natural Sciences, Applied Sciences, Medical and Health Sciences, Pharmaceutical Sciences to Building Science and Technology, Social Sciences, Humanities, and Education. These are available at undergraduate and postgraduate levels to approximately 30,000 students at its 17 Academic Schools on the main campus in the island of Penang; 6 Schools at the Engineering Campus in Nibong Tebal (approximately 50km from the main campus); and 3 at the Health Campus in Kubang Kerian, Kelantan (approximately 300km from the main campus).


UTAR
Established in 2002 with 411 students, today, Universiti Tunku Abdul Rahman (UTAR) offers 110 programmes in fields including Accountancy, Actuarial Science, Agriculture, Arts, Business and Economics, Creative Industries and Design, Engineering and Built Environment, Information and Communication Technology, Life and Physical Sciences, Mathematics and Process Management, Medicine and Health Sciences, and Social Science and Education to more than 26,000 students in its nine faculties, three institutes and three centres located in Sungai Long and the main campus in Kampar, which was awarded the Pertubuhan Akitek Malaysia (Malaysian Institute of Architects) gold award in the education category in 2013.

CONTACT

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