TUM Asia

SIT SINGAPORE INSTITUTE OF TECHNOLOGY

Technische Universität München

# Undergraduate Programmes

## Bachelor of Science in Chemical Engineering
## Bachelor of Science in Electrical Engineering & Information Technology

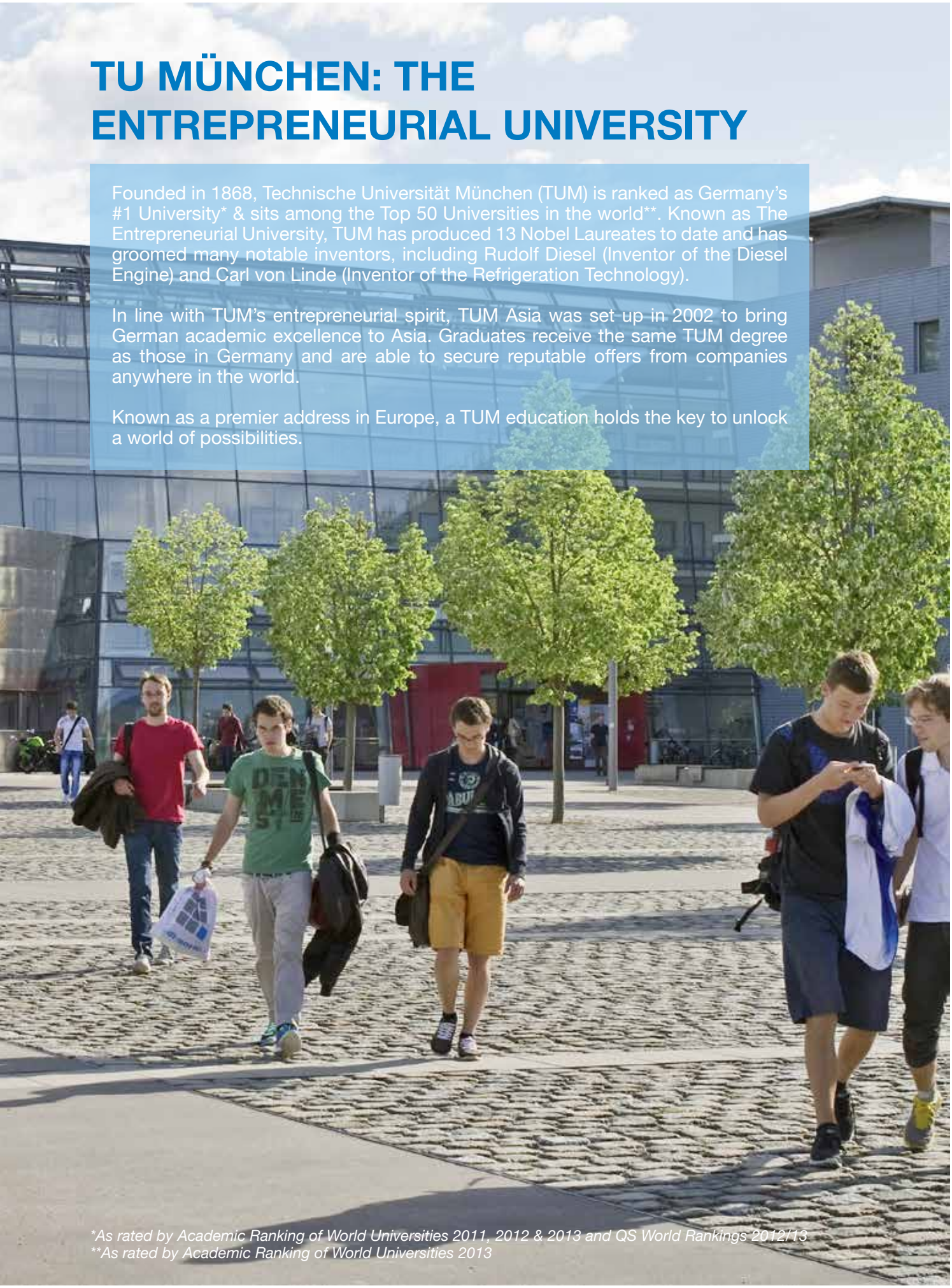
www.tum-asia.edu.sg

# TU MÜNCHEN: THE ENTREPRENEURIAL UNIVERSITY

Founded in 1868, Technische Universität München (TUM) is ranked as Germany's #1 University* & sits among the Top 50 Universities in the world**. Known as The Entrepreneurial University, TUM has produced 13 Nobel Laureates to date and has groomed many notable inventors, including Rudolf Diesel (Inventor of the Diesel Engine) and Carl von Linde (Inventor of the Refrigeration Technology).

In line with TUM's entrepreneurial spirit, TUM Asia was set up in 2002 to bring German academic excellence to Asia. Graduates receive the same TUM degree as those in Germany and are able to secure reputable offers from companies anywhere in the world.

Known as a premier address in Europe, a TUM education holds the key to unlock a world of possibilities.



*As rated by Academic Ranking of World Universities 2011, 2012 & 2013 and QS World Rankings 2012/13
**As rated by Academic Ranking of World Universities 2013

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Bachelor of Science in

# CHEMICAL ENGINEERING

**1** **The Faculty of Chemistry at TUM is ranked first in Germany***

**6** **Nobel Prize winners have been produced in this faculty**

**12** **Placed 12th worldwide in Chemistry***

**DID YOU KNOW? Some of the biggest chemical companies in the world are German (& are our industry partners).**

German universities are known for their academic strength & industry-orientated courses. With us, you will benefit from a practical-based education that prepares you for the challenges in the chemical sectors.

**As ranked by Academic Ranking of World Universities 2012/2013*

For Articulated Diplomas

# PROGRAMME STRUCTURE

## Articulated Diplomas

The graduates of the following Polytechnic Diploma Programmes are eligible to apply for an exemption package up to 18 credits.

**Nanyang Polytechnic**
Diploma in Biologics & Process Technology / Biomedical Engineering / Chemical & Green Technology / Chemical & Pharmaceutical Technology / Food Science & Nutrition / Molecular Biotechnology / Pharmaceutical Sciences / Nanotechnology & Materials Science

**Ngee Ann Polytechnic**
Diploma in Biomedical Sciences / Chemical Engineering / Chemical and Biomolecular Engineering / Molecular Biotechnology / Pharmaceutical Sciences / Pharmacy Science / Biomedical Engineering / Environmental & Water Technology

**Republic Polytechnic**
Diploma in Biomedical Sciences / Biotechnology / Environmental Science / Materials Science / Pharmaceutical Sciences

**Singapore Polytechnic**
Diploma in Applied Chemistry with Pharmaceutical Science / Biomedical Science / Biotechnology / Bioengineering / Chemical Engineering / Chemical Process Technology / Food Science & Technology / Applied Chemistry with Materials Science / Perfumery & Cosmetic Science / Process Engineering

**Temasek Polytechnic**
Diploma in Applied Food Science & Nutrition / Biomedical Engineering / Biomedical Science / Biotechnology / Chemical Engineering / Pharmaceutical Science

*Other relevant diplomas not listed will be considered on a case-by-case basis.

This **Chemical Engineering** degree programme is largely focused on industrial chemistry, dealing with upstream processes of Chemical Engineering. Students will be exposed to the development and design of chemical processes through laboratory experiments and analysis. A strong focus is placed on the fundamentals of inorganic and organic chemistry to provide noble solutions to the petrochemical, pharmaceutical and environmental industries.

**The degree is solely awarded by the Technische Universität München (TUM)** and you will receive a degree certificate identical to those studying in the home campus. The programme structure is similar to that offered in Germany, with modules tailored to suit the industry landscape of Singapore & Asia. The Bachelor Thesis is conducted in Germany at TUM.

> **"World-class chemistry & German engineering from Germany's top university will give the students a bright future for prospective jobs not only in Singapore, but also around the world."**

Prof. Kai-Olaf Hinrichsen
Dean, Chemistry Department, Head of Chair of Chemical Engineering (TUM) / Teaching Professor at TUM Asia

## COURSE OUTLINE

**Year 1**
- Advanced Mathematics 1, 2 & 3
- Physics
- Engineering Thermodynamics
- CAD and Technical Drawing
- General & Inorganic Chemistry
- Information Technology 1
- Analytical Chemistry*
- Advanced Inorganic Chemistry*
- Chemical Thermodynamics

**Year 2**
- Engineering Mechanics 1 & 2
- Materials Science & Engineering
- Chemical Engineering Principles
- Chemical Engineering Design Course
- Basic Quantum Mechanics & Spectroscopy
- Chemical Reaction Engineering and Catalysis
- Organic Chemistry 1 & 2*
- Information Technology 2
- Thermal Process Engineering
- Heat Transfer Phenomena
- Biochemical Process Engineering
- Mechanical Process Engineering

**Final Year (1 Semester)**
- Chemical Engineering 1* & 2*
- Fluid Mechanics
- Chemical Thermodynamics*
- **Bachelor Thesis (Conducted at TUM, Germany)**

**Lab Coursework will be required in these modules*

Students are awarded the degree upon completion of 180 credits.

**Foundation Modules (82 credits):** Mathematics (17 credits) + Basic Natural Sciences & Mechanics (20 credits) + Chemistry (45 credits)
**Advanced Modules (84 credits):** Core Modules (72 credits) + Bachelor Thesis (12 credits)
**Professional Qualifications (14 credits):** Internship (8 credits) + Cross Discipline (6 credits)
*Exemption Package for Articulated Diplomas (18 credits): Biology (4 credits) + Internship (8 credits) + Cross Discipline (6 credits)*

(For Non-Articulated Diplomas, GCE 'A' Levels Graduates, International Baccalaureate & International Students)

# PROGRAMME STRUCTURE

This **Chemical Engineering** degree programme is largely focused on industrial chemistry, dealing with upstream processes of Chemical Engineering. Students will be exposed to the development and design of chemical processes through laboratory experiments and analysis. A strong focus is placed on the fundamentals of inorganic and organic chemistry to provide noble solutions to the petrochemical, pharmaceutical and environmental industries.

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> **"The modules prepares us adequately for the industry, as we use techniques & programs that are actually used in companies today. Our professors also use real problems that they faced in the industry as tutorial questions for us."**

Goh Zhe Liang
Year 3 Student, BSc Chemical Engineering

## COURSE OUTLINE

**Year 1**
- Advanced Mathematics 1, 2 & 3
- Biology
- Physics
- Engineering Thermodynamics
- CAD and Technical Drawing
- General & Inorganic Chemistry
- Information Technology 1
- Analytical Chemistry*
- Advanced Inorganic Chemistry*
- Chemical Thermodynamics

**Year 2**
- Engineering Mechanics 1 & 2
- Materials Science & Engineering
- Chemical Engineering Principles
- Chemical Engineering Design Course
- Basic Quantum Mechanics & Spectroscopy

- **Year 2 (Continued)**
- Chemical Reaction Engineering and Catalysis
- Organic Chemistry 1 & 2*
- Information Technology 2
- Thermal Process Engineering
- Heat Transfer Phenomena
- Biochemical Process Engineering
- Mechanical Process Engineering

**Final Year**
- Chemical Engineering 1* & 2*
- Fluid Mechanics
- Industrial Internship
- Materials Science & Engineering
- Chemical Thermodynamics*
- Cross Discipline
- **Bachelor Thesis (Conducted at TUM, Germany)**

**Lab Coursework will be required in these modules*

Chemical Engineering

# CAREER PROSPECTS

## WE BREAK THE RULES

Instead of only thinking about your career pathway after graduation, the German education system is designed to be industry relevant from the start.

You will have lecturers from the industry and professors with a strong industry background to introduce you to the needs & demands of the industry. Coupled with networking sessions and our close cooperation with internationally renowned MNCs (eg. BASF, Clariant, Evonik, Linde AG, etc), you will be a step ahead of your peers when graduation comes round.

**TUM achieved a score of 96.1 for "Employer Reputation" in the QS World Rankings 2013/2014.**

Singapore is one of the world's leading chemical hubs, and with the extensive development of Jurong Island (attracting investments in excess of S$35 billion), the demand for a well-trained pool of technically skilled engineers is on the rise.

*For more information on Career Prospects in the Chemical sectors, do log onto www.tum-asia.edu.sg/prospects-after-graduation*

Bachelor of Science in

# ELECTRICAL ENGINEERING & INFORMATION TECHNOLOGY

**1** **TUM is ranked first in Germany for Engineering & Mathematics***

**4** **Fourth-best among all Technical Universities in Europe***

**17** **Placed 17th worldwide in Engineering****

**DID YOU KNOW? The Department of Electrical Engineering & Information Technology has the highest percentage of international students & visiting professors in Germany. Siemens AG has been a major partner for decades.**

Apart from the renowned "German Engineering", you will be able to learn from some of the most sought-after professors in the field of electrical engineering. Your industry-relevant education will prepare you for diverse fields in the workforce.

**As ranked by Academic Ranking of World Universities 2012/2013 and 2013/2014*
***As ranked by QS World Rankings 2013/2014*

For Articulated Diplomas

# PROGRAMME STRUCTURE

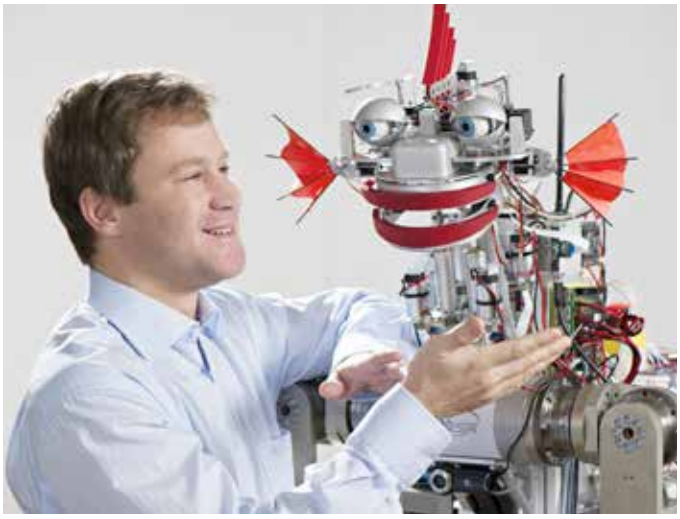
**Electrical Engineering & Information Technology** form the foundation of the digital age and are among the prime engines of technological and economic progress. They offer us a head start on the challenges of the future in areas as diverse as automotive technology, power engineering and electronics engineering, with applications ranging from green energy to electronics, medical technology, space satellites and household appliances. The rapid developments in information and communications technology in particular underscore the tremendous importance of Electrical Engineering & Information Technology.

**The degree is solely awarded by the Technische Universität München (TUM)** and you will receive a degree certificate identical to those studying in the home campus.

The programme structure is similar to that offered in Germany, with modules tailored to suit the industry landscape of Singapore & Asia. The Bachelor Thesis is conducted in Germany at TUM.

Students are awarded the degree upon a completion of 180 credits.

**Foundation Modules (120 credits):** Physics (24) + IT (16) + Mathematics (32) + Electrical Engineering (28) + Signals & Systems (20) **Advanced Modules (42 credits):** Electives (30) + Bachelor Thesis (12) *Exemption Package for Articulated Diplomas (18 credits): Internship (12 credits) + Cross Discipline (6 credits)*



## Articulated Diplomas

The graduates of the following Polytechnic Diploma Programmes are eligible to apply for an exemption package of 18 credits.

**Nanyang Polytechnic**
Diploma in Biomedical Engineering / Electrical Engineering with Eco-Design / Electronics, Computer & Communications Engineering / Engineering Informatics / Information Technology / Information Security / Mechatronics Engineering / Multimedia & Infocomm Technology / Nanotechnology & Materials Science / Telematics & Media Technology

**Ngee Ann Polytechnic**
Diploma in Aerospace Electronics / Audio-Visual Technology / Automation & Mechatronic Systems / Biomedical Engineering / Clean Energy Management / Electrical Engineering / Electronic & Computer Engineering / Electronics & Telecommunications Engineering / Engineering Science / Mechatronics Engineering / Network & Security

**Republic Polytechnic**
Diploma in Aerospace Avionics / Biomedical Electronics (formerly known as Biomedical Electronics Engineering) / Communications & Automation Electronics / Digital Entertainment Electronics / Electrical & Electronic Engineering / Information Technology / Micro & Nanotechnology / Mobile Software Engineering / Renewable Energy Engineering

**Singapore Polytechnic**
Diploma in Aerospace Electronics / Bioelectronics / Clean Energy / Computer Engineering (formerly known as Computer & Network Technology) / Electrical Engineering / Electronics & Communication Engineering / Electronics, Computer & Communication Engineering / Electronics & Computer Control Engineering / Electrical & Electronic Engineering / Energy Systems & Management / Engineering Systems / Engineering with Business / Info-Communication Engineering & Design (formerly known as Info-Communication Technology / Infocomm Security Management / Information Technology / Mechatronics and Robotics

**Temasek Polytechnic**
Diploma in Aerospace Electronics / Biomedical Engineering / Biomedical Informatics & Engineering / Clean Energy / Computer Engineering / Electronics / Infocomm & Network Engineering / Microelectronics / Mechatronics / Media & Communication Technology / Telecommunications

*Other relevant diplomas not listed will be considered on a case-by-case basis.

**"To enrol yourself into this programme is to take on the challenge of building a career foundation that will stand the test of time. Equipped with the fundamentals of electrical engineering and information technology by the elite of German professors from TUM, this will last as a solid rock for your career for decades."**

Prof. Wolfgang Utschick
Dean of Student Affairs, Department of EEIT (TUM) & Head of Associate Institute for Signal Processing (TUM) / Teaching Professor at TUM Asia

For Articulated Diplomas

# PROGRAMME STRUCTURE

## COURSE OUTLINE

**Year 1**
- Calculus 1 & 2
- Linear Algebra
- Circuit Theory 1 & 2
- Digital Technology
- Algorithms and Data Structures
- Computer Technology
- Physics
- Electricity & Magnetism

**Year 2 & Year 3**
- Calculus 3
- Discrete/Numerical Mathematics (Choose either)
- Measurement & Sensor Technology
- Electrical Energy Technology
- Electronic Devices
- Signal Representation
- Stochastic Signals
- Communication Engineering
- Control Engineering 1
- Electromagnetic Field Theory
- Materials for Electrical Engineering
- Electives
- **Bachelor Thesis (Conducted at TUM, Germany)**

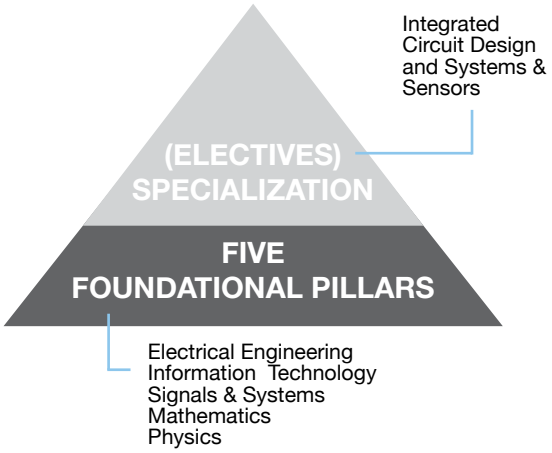
## ELECTIVES

**Integrated Circuit Design**
- Cryptology & IT-Security
- Signal Processing Systems
- Lab Course Analog Circuit Design
- Lab Course Digital Circuit Design

**Systems & Sensors**
- Micro System Technologies (MEMS Components)
- Real-Time and Embedded Systems
- Dynamic Systems and Control 2
- Control & Automation Laboratory

*Continued from Page 11*

This degree programme delivers competencies based on the 5 pillars of Electrical Engineering & Information Technology (Mathematics, Physics, Electrical Engineering, Information Technology and Signals & Systems) . Under the electives you are offered specialisations in the areas of Systems & Sensors and Integrated Circuit Design.




**"TUM Asia was the 1st pick among my university choices because of the type & quality of education provided as well as the international reputation of the TUM itself. The professors are unparalleled in their research & expert knowledge, yet friendly & hospitable!"**

Nurzahidah Mohd Yusoff
Year 2 Student, BSc Electrical Engineering & IT

(For Non-Articulated Diplomas, GCE 'A' Levels Graduates, International Baccalaureate & International Students)

# PROGRAMME STRUCTURE

**Electrical Engineering & Information Technology** form among the prime engines of technological and economic progress. They offer us a head start on the challenges of the future in areas as diverse as automotive technology, power engineering and electronics engineering, with applications ranging from green energy to electronics, medical technology, space satellites and household appliances. The rapid developments in information and communications technology in particular underscore the tremendous importance of Electrical Engineering & Information Technology.

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## COURSE OUTLINE

**Year 1**

- Calculus 1 & 2
- Linear Algebra
- Circuit Theory 1 & 2
- Digital Technology
- Algorithms and Data Structures
- Computer Technology
- Physics
- Electricity & Magnetism

**Year 2 & Year 3**

- Calculus 3
- Discrete/Numerical Mathematics (Choose either)
- Measurement & Sensor Technology
- Electrical Energy Technology
- Electronic Devices
- Signal Representation
- Stochastic Signals
- Communication Engineering
- Control Engineering 1
- Electromagnetic Field Theory
- Materials for Electrical Engineering
- Electives
- Cross Discipline Modules
- **Bachelor Thesis (Conducted at TUM, Germany)**
- **Industrial Internship (Minimum of 8 weeks)**

## ELECTIVES

**Integrated Circuit Design**

- Cryptology & IT-Security
- Signal Processing Systems
- Lab Course Analog Circuit Design
- Lab Course Digital Circuit Design

**Systems & Sensors**

- Micro System Technologies (MEMS Components)
- Real-Time and Embedded Systems
- Dynamic Systems and Control 2
- Control & Automation Laboratory

Electrical Engineering

# CAREER PROSPECTS

## WE BREAK THE RULES

Instead of only thinking about your career pathway after graduation, the German education system is designed to be industry relevant from the start.

You will have lecturers from the industry and professors with a strong industry background to introduce you early to the industry landscape. Coupled with networking opportunities, graduates will enjoy connections with the movers and shakers in the electronics industry including Broadcom, Qualcomm, Rohde & Schwarz, Lantiq, Infineon Technologies, Xilinx, Marvell, Micron and many more.

*Dr. Wolfgang Heubisch, Bavarian State Minister of Sciences, Research and the Arts, speaks with some of our Electrical Engineering & Information Technology students*

**TUM achieved a score of 96.1 for "Employer Reputation" in the QS World Rankings 2013/2014.**

Graduates from the programme will be able to find opportunities in the fields of Integrated Circuits, Electronics, Intelligent Energy Networks, Electromobility, Human Machine Interaction, Robotics, Media Technology, Communications Engineering & more.

*For more information on Career Prospects in the Electronics sectors, do log onto www.tum-asia.edu.sg/prospects-after-graduation*

Centre for Electromobility, Singapore

# TUM CREATE

TUM is known for its research capabilities and strength in innovation. As such, TUM Asia spearheaded the set up of TUM CREATE as a base for research here in Singapore. TUM CREATE is a joint research programme between Technische Universität München (TUM) and Nanyang Technological University (NTU). It is part of the Campus for Research Excellence And Technological Enterprise (CREATE) programme funded by the National Research Foundation, an agency of the Prime Minister's Office in Singapore.

The electromobility research institute brings together the expertise and knowledge of Germany and Singapore, to drive innovation to shape the future of sustainable mobility by tackling issues ranging from the molecules to the megacity. **Graduates from the TUM Asia undergraduate programmes have the opportunity to apply for positions at TUM CREATE, especially if your interest lies in research/electromobility.**

**In early 2013, TUM CREATE released the VOI, a multi-purpose scooter prototype. The VOI is designed to be a versatile urban mobility solution for densely populated megacities.**

> **"We combine German expertise from TUM with Singapore's existing knowledge in our cutting edge research at TUM CREATE. Our goal is to develop knowledge, build capacity and contribute to the local R&D landscape."**
>
> Professor Harry Hoster
> Scientific Director, TUM CREATE

**Merely after two years of research and development, TUM CREATE unveiled the electric taxi prototype EVA that was designed and built from the ground up. It features the technologies and innovations developed by their scientists and engineers.**


**Over**

**100**

**scientists & engineers working in**

**10**

**research areas, including energy storage, EV design, computer modeling & simulation and transportation engineering**

Photos: TUM CREATE


# I LIVE IN MUNICH

**As part of TUM Asia's undergraduate degree requirements, every student will complete his/her Bachelor Thesis in the home campus of TUM after successfully completing his/her coursework. Each student will have the opportunity to spend two to six months living and studying in Munich, as part of the Overseas Immersion Programme (OIP) experience.**

Photos: Adrian Wong and Huang Yilong

This experience is designed not only for the benefit of the student's academic learning, but also for the development of lifeskills. Living abroad & caring for oneself's needs will enable every student to pick up soft skills that will never be learnt in the classroom. Students will also pick up basic German for day-to-day living & learn the tact of assimilating into another culture - a key skill in today's globalized workforce.

The city of Munich, famous for the "Oktoberfest", is home to two of the most elite universities in Europe. Munich attracts a strong number of international students each year as the city is safe & easily accessible by public transport (the trains run till 3am!). Munich is centrally located to the neighbouring countries such as Switzerland, Austria, France and Italy, which makes short leisure trips possible on weekends. Our professors have also commented that Singapore can be extremely similar to Munich - apart from the weather!

# GRADUATE STORIES

**Different from the traditional way of teaching, our TUM professors gave us a practical education, combining theory with industry-relevant application. This fully prepared us for the challenges of the workplace, in dealing with technical problems and finding new solutions to improve lives.**

**Besides being taught by some of the most-experienced professors in the field of academia, the time spent in Munich on my thesis took us through a cultural and academic experience from the inside out. Working on my thesis gave me the opportunity to take what I know in theory and put it into application. It allowed me to innovate and explore the possibilities.**

**It has been a great privilege to be a TUM student and benefit from all that TUM has to offer. Now I stand strong & confident, ready to tackle the challenges offered to me in the workplace.**

**Yue Chao**
Product Engineer
ASM Pacific Technology Ltd *(Incorporated in Netherlands)*
BSc Electrical Engineering & I.T. (Best Student Award)

**My thirst for knowledge has been fueled and empowered during my studies. Even though our professors may be having jet-lag from their long flights from Germany, they never fail to put in 101% to prepare their materials for our classes.**

**Our professors have never dismissed a question or called it "stupid". They recognize the value in every student & the low student-teacher ratio gives everyone ample opportunities to clarify their doubts.**

**Though the curriculum is challenging, it has been a journey worth taking. With sharpened critical thinking skills and a strong theoretical foundation, I am ready to take on the challenges in the industry. Chemicals are a big part of our lives & I want to create a sustainable world through what I do.**

**Lee Poh Sein**
BSc Chemical Engineering
SIT-Wilmar Scholarship Recipient

**TUM Asia has taught me how to be inquisitive and challenge the status quo. Our German professors would always probe us with questions during classes and they never let the question slip without an answer from anyone.**

**I have learnt to think critically and gained the confidence to speak up. These skills and the knowledge I have, has built me a strong foundation for my career. As I step out into the workforce, I can proudly say that my TUM education stands a cut among the rest.**

**Richard Tan**
Project Engineer
Leading Electronics & Communications Organization
BSc Electrical Engineering & I.T.

# How to apply

Applications for our undergraduate programmes are facilitated by Singapore Institute of Technology (SIT). You may apply online via **SingaporeTech.edu.sg**. Kindly refer to SIT's website for tuition fees and other relevant admission criteria.

# Contact us

**TUM Asia (Undergraduate Office)**
Singapore Polytechnic
500 Dover Road, T1A #02-21
Singapore 139651

Tel: +65 6870 8293
Email: undergraduate@tum-asia.edu.sg

www.tum-asia.edu.sg
www.facebook.com/tum.asia

TUM Asia is a 100% subsidiary of the Technische Universität München // www.tum.de
CPE Registration Number: 200105229R / Reg. Period: 13.06.2011 - 12.06.2017
Photos: TUM / TUM Asia; Published by: TUM Asia, Corporate Communications
Information published: October 2013.