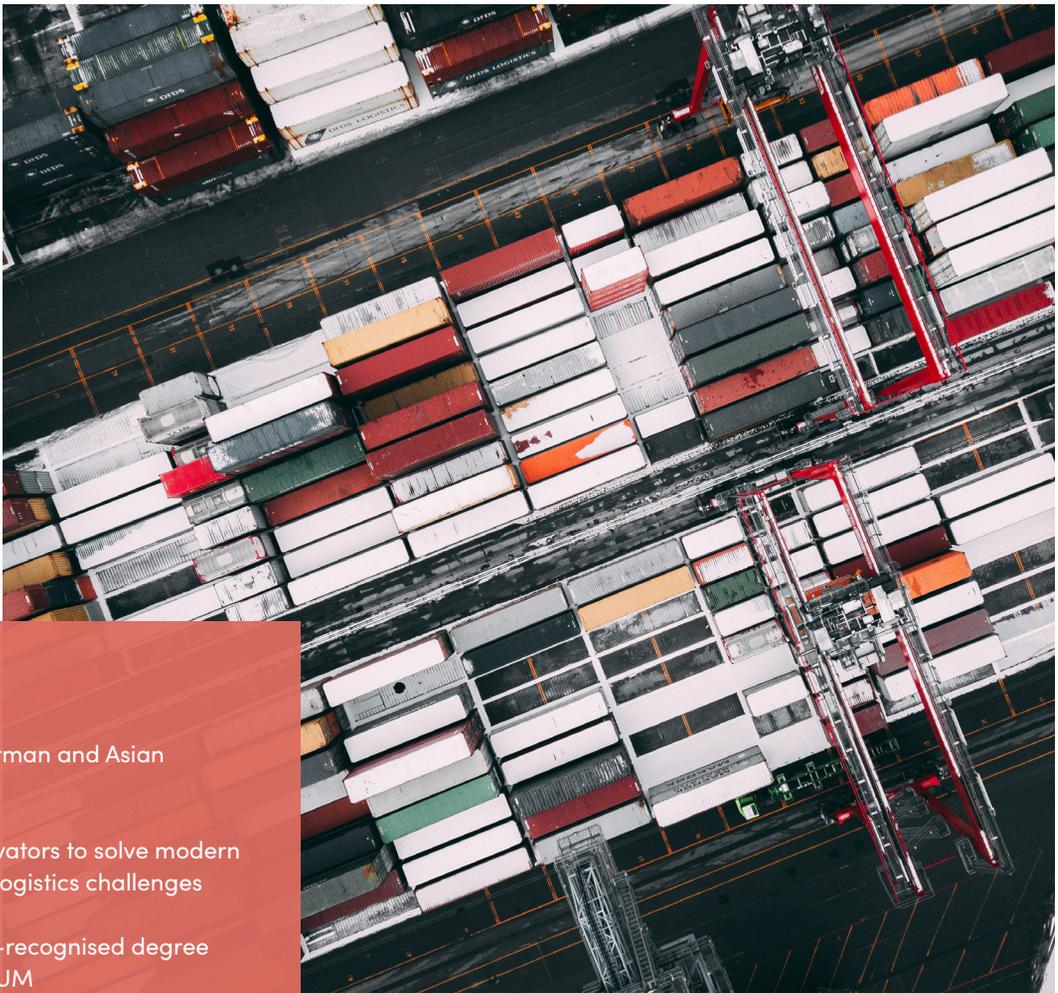TUM Asia

MASTER OF SCIENCE

Rail, Transport and Logistics

At a Glance

- The best of German and Asian expertise

- Nurturing innovators to solve modern transport and logistics challenges

- Internationally-recognised degree conferred by TUM

- Bright career prospects regionally and worldwide

- Apply online at **www.tum-asia.edu.sg**

Technical University of Munich

TUM

About
TUM

Technical University of Munich (TUM)

The Technical University of Munich (TUM) was founded in 1868 and is one of Europe's leading technical universities. Serving as an entrepreneurial university that promotes talents and creates value for society, TUM has produced 17 Nobel Prize winners since 1927, most notably Ernst Otto Fischer (Chemistry) and Rudolf Mößbauer (Physics). Its focus areas are engineering sciences, natural sciences, life sciences, medicine, management and political and social sciences.

TUM promotes talents with its network of strong partners in research and industry. It is represented worldwide with the TUM Asia campus in Singapore, as well as offices in Beijing, Brussels, Cairo, Mumbai, San Francisco and São Paulo.

In international rankings, TUM regularly places among the best universities in Germany and worldwide. It is the only university to have won recognition as a German 'Excellence University' in every round since 2006.

Technical University of Munich (TUM) Asia

Technical University of Munich (TUM) Asia was set up in 2002 as the first academic venture abroad by a German university, blending German academic excellence with industry relevance in Asia. Its partnerships with top Asian universities and industry leaders combine German engineering with Asian relevance to equip talents for industry and research sectors in the world.

With the changing needs of the economy, the specialised Master programmes that are offered keep pace with industry needs through an Asian-European perspective. Lecturers and professors hail from as far as Germany to equip students with their rich knowledge and experience.

More than a thousand students have come through the doors of TUM Asia and now ply their trades in top research institutes and companies across the globe.

NO. 1 university — TUM is ranked as the no. 1 University in Germany[+]

NO. 6 in employability — TUM ranked no. 6 in the Global Employability Survey[^]

17 Nobel Prize recipients — 17 scientists and alumni of TUM have received the Nobel Prize

50 universities — TUM is ranked among the world's Top 50 Universities[#]

[+] As rated by QS World Ranking 2015 –2019 and Academic Ranking of World Universities (Shanghai ranking) 2011 – 2013, 2016
[^] As ranked in the 2018 & 2019 Global University Employability Ranking by Times Higher Education (THE)
[#] As rated by Times Higher Education World University Rankings 2020, QS World Ranking 2018 and Academic Ranking of World Universities (Shanghai ranking) 2016 – 2018

Master of Science | Rail, Transport and Logistics

Programme
Overview

Awarded by TUM, the **Master of Science in Rail, Transport and Logistics (MSc in RTL)** will provide graduates with the necessary knowledge and skills to employ a diverse range of technologies that leverage on state-of-the-art railway, transport and logistics systems. One will learn how to implement sophisticated and far-reaching solutions to transportation challenges that characterise modern economies.

Programme Structure and Timeline

16 modules
- 6 Core Modules
- 9 Specialisation Modules (Core & Elective Modules)
- 1 Non-Technical Elective Module

45 contact hours
for every Core and Elective Module

2 Years
- Full-time programme
- Coursework in Singapore
- Internationally-recognised degree

July	Year 1	Year 2	Graduation
Arrival in Singapore	• Core Modules • Elective Modules • Non-Technical Elective Module	• Elective Modules • Internship • Master Thesis at a company, university or research institute (Supervised by a TUM professor)	End of programme

Note: This outline is a general reference to the duration of study. A student's actual duration of study may or may not follow this general reference. This outline is subject to change during the course timetable.

Programme Modules

Compulsory Core Modules

Decision Support for Logistics Management

This lesson will provide an overview of currently available mathematical modelling approaches and computer-based support for the solution of typical logistical decision problems. Students will learn how to model different problem types. A selected number of algorithms which solve the formal problem models will be introduced. This lesson enables the students to detect a known problem type in real life logistics, understand the limits of optimisation, and the value of decision support systems in logistics.

Public Transport Planning

This module will provide an introduction to public transport planning. The objective of this module is to provide in-depth knowledge about the planning and organising of public transport networks. The module will start with a discussion about the advantages, disadvantages and the functional characteristics of transit modes and their capacity. Other topics covered in this module include: the geometry and types of transit lines and transit networks; how to organise transfers and increase the transit speed to improve passenger convenience and the efficiency of the public transport network; and an introduction to public transport scheduling.

Soft Skills

This module consists of two parts: scientific paper writing and German language skills. The scientific paper writing exercise aims to teach students technical writing techniques and familiarise them with the international usage of the English language in technical communication. Students will learn how to use English especially in academic writing, such as how to write motivation letters, theses, technical and scientific papers, as well as how to make effective technical presentations. The German language skills exercise aims to teach students the basics of German language, thereby providing them with insights into why German culture is considered part of world heritage.

Statistical Methods for Transport and Logistic Processes

This module provides an introduction into transportation science, which involves analysis of empirical data and application of common statistical methods to analyse the data in practical applications.

Traffic Impacts, Evaluation of Transport and Logistic Processes

This module will introduce the correlation between transport and the environment. Moreover, this module will examine the characteristics of a sustainable transportation system. Some strategies for achieving such a sustainable transportation system will be discussed with and explained to the students. The second part of this module introduces the basic principles and concepts of an assessment and evaluation of transport and logistics systems. The advantages and disadvantages of different assessment methods (Cost-benefit analysis, multi-criteria analysis, Balancing and Discussion Method, Environmental Impact Assessment, ranking, cost-efficiency analysis etc.) will be introduced, including application areas and initial constraints of specific assessment procedures.

Transport and Urban Planning

The module provides basic knowledge about transport, mobility and urban planning. The main topics are: reasons for traffic, spatial and temporal traffic distribution, relationship between planning and design of the infrastructure and the assignment of functions in cities and conurbations, as well as dependencies between supply and demand. The theory of travel demand modelling (4-step algorithm for travel demand estimation, etc.) is another important topic in this module.

Specialisation Modules
(Choose 1: Logistics, Railway, Transport)

LOGISTICS

Core Modules
- **Introduction to Business Logistics**
- **Introduction to Supply Chain Management**

Elective Modules*
(Choose a minimum of 7 modules from the list below)
- **Airport and Harbour Design**
- **Basics of Traffic Flow and Traffic Control**
- **Consumer Industry Supply Chain Management**
- **Design and Application of Material Handling Systems**
- **Green Supply Chain and Risk Management**
- **Health Care Logistics**
- **Highway Design**
- **Industrial Logistics**
- **Logistics Service Provider (LSP) Management**
- **Planning of Intralogistics Systems**
- **Smart Methods and Technology**
- **Transportation Modelling and Simulation Tools**

RAILWAY

Core Modules
- **Rail Transport and Rail Planning**
- **Rolling Stock**
- **Trackworks**
- **Train Control and Signalling Systems**

Elective Modules*
(Choose a minimum of 5 modules from the list below)
- **Airport and Harbour Design**
- **Ballastless Track Systems**
- **Basics of Traffic Flow and Traffic Control**
- **Highway Design**
- **Industrial Logistics**
- **Introduction to Power Systems**
- **Modelling of Rail Infrastructure using CAD-FEM-MBS**
- **Traffic Operation and Control ITS**
- **Transportation Modelling and Simulation tools**
- **Tunnel Works and Geotechniques**

TRANSPORT

Core Modules
- **Basics of Traffic Flow and Traffic Control**
- **Highway Design**
- **Transportation Modelling and Simulation Tools**

Elective Modules*
(Choose a minimum of 6 modules from the list below)
- **Airport and Harbour Design**
- **Industrial Logistics**
- **Introduction to Business Logistics**
- **Introduction to Supply Chain Management**
- **Rail Transport and Rail Planning**
- **Trackworks**
- **Traffic Operation and Control (ITS)**
- **Urban Road Design**

Non-Technical Elective Modules
(Choose 1 module)

Business Administration
The primary purpose of the module is to introduce students to the different areas of business administration with the final objective to give them a basic understanding of how to face decision problems in a company. Most importantly, we will analyse long-term investment decisions, how to set up strategic planning in a company, how to gather timely information about the current situation of a company, and how to set up its long-term financial structure.

Industrial Marketing
Marketing strategies are developed for a typical commodity and speciality business. Students will work in teams to develop business cases, make their own business decisions and develop marketing concepts based on provided information of a real case study.

Innovation and Technology Management
This module presents the dynamics of technological development through innovation and the related management issues, the difference between creating a new product (invention) and improving an existing product/idea (innovation), startups and financing of innovation, innovation-driven economic cycles and innovation impact on growth and jobs.

International Intellectual Property Law
This module will give a brief introduction to intellectual property rights and focus on insights into general principles of patent law and international conventions governing the patent law. Current developments and criticism of the current patent law system will also be addressed. In addition, practical (legal) aspects of the commercialisation of patents will be dealt with.

Legal and Safety Aspects in Industry
Upon successful completion of the module, students are able to understand the investment environment of business entities in Singapore, the nature of bilateral and multilateral agreements, different facets of setting up a company – such as hiring policies for its workforce, incorporating a company with shareholders and directors, as well as an overview of annual accounting requirements. They can also familiarise themselves with the concept of limited liability partnerships (LLPs), the duties of a company director, his/her required qualifications and responsibilities, as well as formation of contracts and dispute resolution. More importantly, these concepts are taught to students in the context of Singapore's business landscape within its legal framework. Another key concept dealt with in this module is the rules and regulations of International Commercial Terms (Incoterms), as well as an introduction to legal systems in the world and resolution strategies for labour issues.

Modern Developments in Industry
The module will provide insights in the core elements of Industry 4.0 such as: introduction to Cyber-Physical Systems, Radio Frequency Identification (RFID) technologies, information collection with intelligent sensors, industrial networking to connect machines and processes, Manufacturing Execution System (MES) for order management, as well as production control and value adding to the complete supply chain management.

Production Planning In Industry
Manufacturers are confronted with special requirements of their production processes. Cycles, by-products, batches and campaigns are difficult to handle by Enterprise Resource Planning (ERP) software packages nowadays. Concepts of material requirements planning, supply chain management (SCM) combined with basics in cost accounting will be explained.

For specialisation module synopses, please visit **https://tum-asia.edu.sg/admissions/graduate/msc-rail-transport-logistics/** to view the course structure information.

The TUM Experience

> **TUM Asia's Master of Science programme in Rail, Transport and Logistics provided me with a comprehensive platform to develop my skills and choose a career in the field of Railway Engineering. Together with a multi-cultural environment, the cross-discipline nature of this specialisation offers a variety of case studies, practical experiences and experimental tasks for a better understanding of the railway environment.**

Harish Narayanan
Alumni
*Master of Science
in Rail, Transport and Logistics*

Entrepreneurial Thinking and Engagement

You will formulate and discuss ideas based on the diverse economic realities and learn to see from multiple vantage points. The unique joint degree programme equips you not only with the technical knowledge, but also with the business and cultural aspects of the subject.

Industry Relevance

Our professors - the world's best – are industry experts and active researchers. This allows you to learn from a curriculum that is built around the latest technological trends and knowledge.

Highest International Standards

You will receive a holistic learning experience with the local lecturers from academia and industry. Our TUM modules are covered by professors who fly in from Germany on an exclusive teaching basis, to ensure that you get the undivided attention of their lecturers.

Global Prospects

You can choose to complete your internship and thesis in Singapore or anywhere in the world with a company, university or research institute. Your internationally recognised degree and experience is a great boost to your profile for future global job opportunities.

TUMCREATE

TUMCREATE is a joint programme between the Technical University of Munich (TUM) and the Nanyang Technological University (NTU). The electromobility institute brings together the expertise and innovation of Germany and Singapore to drive innovation and shape the future of sustainable mobility by tackling issues ranging from molecules to the megacity. Graduates have the opportunity to apply for positions at TUMCREATE, especially if your interest lies in the area of transportation and mobility research.

Industry
Outlook

Did you know that Singapore has **a vibrant ecosystem of major logistics companies, and enjoys a stable city environment for companies to test and develop smart mobility technologies?**

Heart of Southeast Asia: Singapore's Strategic Location

Singapore is the leading transportation and logistics hub in the world. Singapore's global connectivity and its secure and business-friendly import and export procedures provide companies much ease in conducting business. Singapore also possesses world-class infrastructure to help support the growth of the logistics industry, such as the Airport Logistics Park of Singapore (ALPS) in the airport's free-trade zone. The railway Industry in Singapore is demonstrating steady growth, with plans outlined to increase manpower, especially due to continual extensions of the current MRT network.

Source: Singapore Economic Development Board

Industry breakdown of our graduates

Industry	%
Logistics	29%
Computing and IT	9%
Consultancy	8%
Research	8%
Engineering and Technology	8%
Pharmaceutical and Medical	8%
Semiconductor	8%
Rail and Transport	6%
Academic	3%
Others	13%

Singapore is

1ST

in efficiency of customs clearance, out of 160 countries. Singapore Customs processes 90% of electronics permit applications within 10 minutes and clears 90% of physical cargo within 8 minutes.

Singapore's Changi Airport is one of Asia's largest cargo airports and handles close to

3 million tonnes

of cargo annually.

Singapore's location is also proximate to the world's major markets as it is situated within a
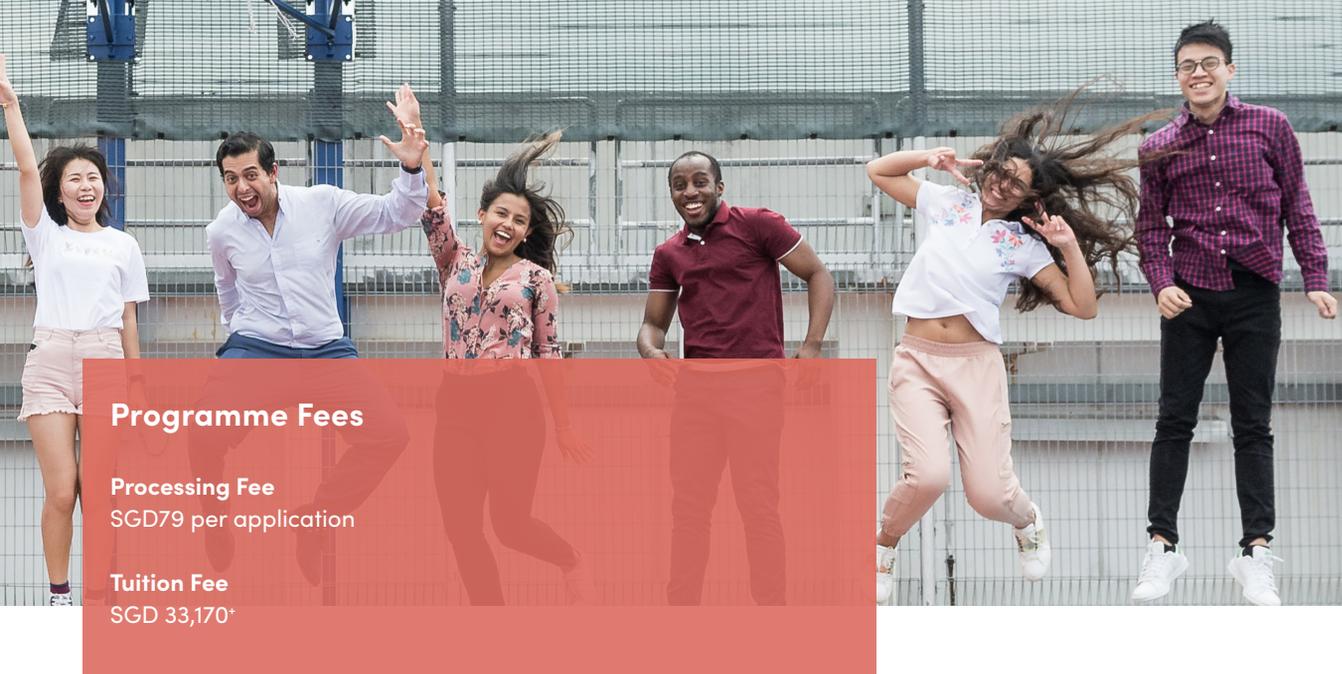
7 HOUR

flight radius to half the world's population in Asia Pacific.

Singapore is linked to more than

600

ports across 120 countries worldwide. Annually, more than 130,000 ships call at Singapore.

Our Graduates

Our graduates in Rail, Transport and Logistics are employed all over the world, with a majority in Singapore, China and Europe.

The most commonly accepted positions are Transportation Engineer, Supply Chain Consultant, Business Analyst, Operations Executive, Logistics Specialist, Procurement Analyst, Applications Engineer, Customer Service Management.

Others may also choose to continue their academic journey with a doctoral candidate position (PhD).

Programme Fees

Processing Fee
SGD79 per application

Tuition Fee
SGD 33,170+

Admission Criteria

- **Bachelor Degree** in any of the following fields: **Civil Engineering, Computer Science, Electrical Engineering, Mathematics, Mechanical Engineering, Transport Engineering** (list is not exhaustive)
- Bachelor Degree certificate or enrolment letter*
  (if you have not completed your Bachelor Degree)
- Academic transcripts or mark sheets*
- **Statement of Purpose** indicating the reason(s) you are interested in this programme
- **Curriculum Vitae / Résumé**
- **TOEFL** test score (≥88 for Internet-based test, DI code: 7368) or **IELTS** test score (≥6.5 overall) taken no more than two years ago from date of submission
- **Akademische Prüfstelle (APS) certificate** for applicants who hold a degree from China, Vietnam, or Mongolia

+ Tuition fees are to be paid in 3 instalments.

+ The tuition fee includes teaching fees, laboratory expenses and cost of mandatory events. The tuition fee does not include airfare, accommodation, living expenses, and miscellaneous fees (registration, IT facilities, matriculation, examination, amenities, copy right, sports, insurance and medical).

+ The tuition fee stated is accurate as of 1 January 2020. All fees are subject to revision due to currency fluctuations, at the discretion of TUM Asia. All fees quoted are inclusive of 7% Singapore's Government Goods & Services Tax. Please refer to our website for fee updates.

+ Documents which are not in English must be translated by a certified translator. All applicants are also required to submit an additional of
 - 2 notarised copies of official or provisional Bachelor's Degree certificate
 - 2 notarised copies of official academic transcript, and
 - 2 passport-sized photographs when you have accepted the offer of admissions and are being matriculated into our programme.

The full application process and documents required for submission is available at
www.tum-asia.edu.sg/application-process

Applications open 1 October every year.

TUM Asia

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