Master of Science
Transport & Logistics

TUM Asia

TUM
Technische Universität München

At A Glance

DEGREE BY
Technische Universität München (TUM)

18 - 24 MONTHS FULL TIME PROGRAMME
Coursework in Singapore

PRACTICAL KNOWLEDGE
Compulsory Internship & Thesis

GLOBAL PROSPECTS
Internationally Recognized Degree

3 SPECIALISATIONS
Logistics, Railway Engineering, Transport

INTAKE
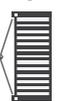August Every Year

TO APPLY
Apply online from 15th October at
www.tum-asia.edu.sg

1 TUM is ranked as the #1 University in Germany[+]

8 TUM ranked #8 in the Global Employability Survey[^]

13 TUM has produced 13 Nobel Laureates

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

TUM Asia

Through TUM's unwavering commitment to the betterment of society, TUM Asia was set up in 2002 as the first academic venture abroad by a German university. Today, TUM Asia offers standalone and joint Bachelor and Master programmes in Singapore together with partner universities such as National University of Singapore (NUS), Nanyang Technological University (NTU) and Singapore Institute of Technology (SIT).

A close cooperation with key industry players helps to ensure that the curriculum stays relevant and practical to the needs of the industry. Together with the unique combination of German engineering with Asian relevance, TUM Asia's graduates are equipped to enter both industry and research sectors on a global level. With over a decade of experience, TUM Asia continues to provide quality higher education programmes suited to the needs of the industry in Asia.

In 2015, over one thousand students have come through the doors of TUM Asia and currently ply their trades in top research institutes and companies across the globe.

Technische Universität München (TUM)

Technische Universität München (TUM) is one of Europe's leading research universities, with around 500 professors, 10,000 academic and non-academic staff, and more than 37,000 students. Its focus areas are the engineering sciences, natural sciences, life sciences and medicine, reinforced by schools of management and education.

TUM acts as an entrepreneurial university that promotes talents and creates value for society. In that it profits from having strong partners in science and industry. It is represented worldwide with a campus in Singapore as well as offices in Beijing, Brussels, Cairo, Mumbai, and São Paulo.

Nobel Prize winners and inventors such as Rudolf Diesel and Carl von Linde have done research at TUM. In 2006 and 2012 it won recognition as a German "Excellence University." In international rankings, TUM regularly places among the best universities in Germany.

Master of Science
Transport & Logistics

TUM Asia's Master of Science in Transport & Logistics (MSc in TL) will provide graduates with the necessary knowledge and skills to employ a diverse range of technologies that leverage on state-of-the-art transport and logistics technologies. One will learn to implement sophisticated and far-reaching solutions to transportation challenges that characterize modern economies.

COURSE OUTLINE

15 The student has to complete between 15 to 18 modules across 2 to 3 semesters

3 Specialisations to choose from: Logistics, Railway Engineering, Transport

45 Contact hours for every Core & Specialised Module

MASTER DEGREE
Conferred by Technische Universität München (Germany), the #1 University in Germany[+]

3 TO 4 SEMESTERS
Full-time research and application focused programme, inclusive of internship experience and Master Thesis writing
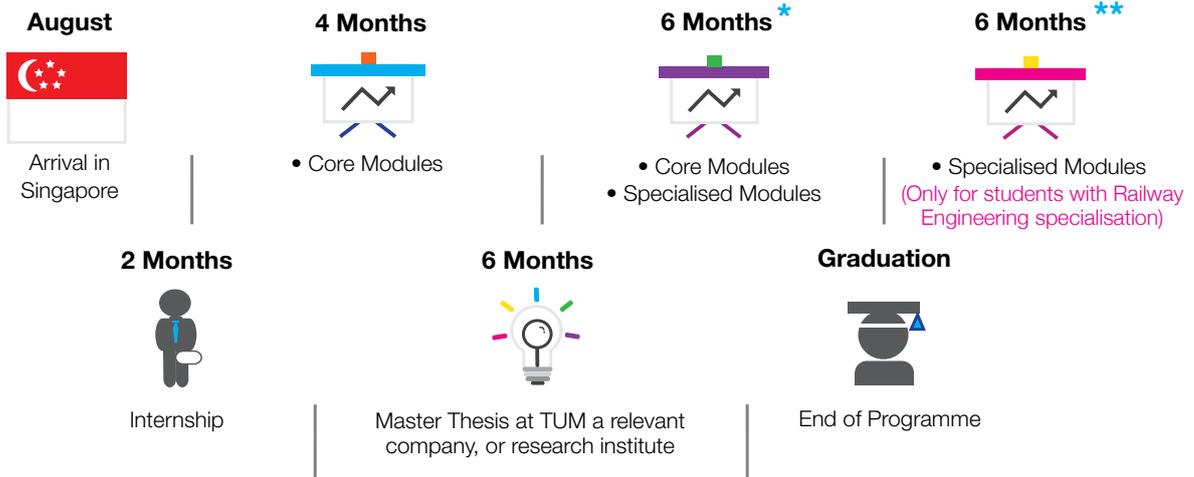
INDUSTRY RELEVANCE
Our professors are actively involved in research and cooperation projects with leading industrial companies, allowing them to base the curriculum around the latest technological trends and knowledge

GLOBAL OPPORTUNITIES
You are able to complete your Internship and Thesis in Munich, Singapore or anywhere in the world, to look for job opportunities globally

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Duration of the Programme: 18 - 24 months

August
Arrival in Singapore

4 Months
- Core Modules

6 Months *
- Core Modules
- Specialised Modules

6 Months **
- Specialised Modules
(Only for students with Railway Engineering specialisation)

2 Months
Internship

6 Months
Master Thesis at TUM a relevant company, or research institute

Graduation
End of Programme

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* All students may complete an additional semester in TUM, resulting in an addition of a 3 month break and a 6 month semester at TUM prior to the internship. The student can choose any module from all faculties in TUM, subject to the approval from the faculties and registration process via TUM Asia, and visa approval. To find out more, please write to us at graduate@tum-asia.edu.sg.

** Students who choose the Railway Engineering specialisation are required to complete this additional semester at TUM's main campus in Munich.

Module Overview

Students are required to complete the following list of compulsory modules, before selecting their specialisation:

Compulsory Modules

Core Modules
- Statistical Methods for Transportation and Logistic Processes
- Traffic Impacts, Evaluation of Transport and Logistic Processes
- Basics of Traffic Flow and Traffic Control
- Transport and Urban Planning
- Highway Design
- Soft Skills (Excursion Practical Experience in Warehouse & Distribution)

Students are required to choose one of the following specialisations:

LOGISTICS   OR   TRANSPORT   OR   RAILWAY ENGINEERING

Core Modules (LOGISTICS)
- Introduction to Business Logistics
- Decision Support for Logistics Management
- Introduction to Supply Chain Management
- Cross-Discipline Modules (Business & Technical English, Selected Topics in Business Management, Aspects of European and Asian Relations Today, Selected Topics in Business Administration)

*Specialised Modules
(Choose 4 modules from the list below and 1 from Transport's specialised modules)

- Industrial Logistics
- Consumer Industry Supply Chain Management
- Logistics Service Provider (LSP) Management
- Health Care Logistics
- Green Supply Chain and Risk Management
- Design and Application of Material Handling Systems

Core Modules (TRANSPORT)
- Introduction to Business Logistics
- Decision Support for Logistics Management
- Introduction to Supply Chain Management
- Cross-Discipline Modules (Business & Technical English, Selected Topics in Business Management, Aspects of European and Asian Relations Today, Selected Topics in Business Administration)

*Specialised Modules
(Choose 4 modules from the list below and 1 from Logistics' specialised modules)

- Traffic Operation and Control (ITS)
- Transportation Modelling and Simulation Tools
- Public Transport Planning
- Airport and Harbour Design
- Rail Transport and Rail Planning
- Urban Road Design

Core Modules (RAILWAY ENGINEERING)
- Traffic Operation and Control (ITS)
- Transportation Modelling and Simulation Tools
- Rail Transport and Rail Planning
- Trackworks I
- Trackworks II (Urban Rail Focus)
- Public Transport Planning
- Train Control and Signalling Systems
- Rolling Stock
- Soft Skills
Cross-cutting fundamentals and methods

*Specialised Modules Conducted In Munich**
(Choose 2 to 4 modules from the list below. Each student must accumulate 11 credits)

- Civil Engineering in Energy Technology
- Energy Systems and Energy Economy
- Power Transmission Systems
- Local Public Transport Strategy and Organization
- Geo Information
- Land Use and Transport (Strategies and Models)
- Road Design
- Computer Aided Traffic Engineering with Matlab
- Urban Infrastructure Design
- Strategies in Megacity Regions and Developing Countries

For module synopsis, please refer to the additional handout, or visit www.tum-asia.edu.sg/admissions/programme-brochures for the online version.

Module Synopsis

Compulsory Modules For All Specialisations

Core Modules

Statistical Methods for Transportation and Logistic Processes
Transportation science involves analysis of empirical data. The students will learn to apply the most common methods in statistics used to analyse data in practical applications.

Traffic Impacts, Evaluation of Transport and Logistic Processes
This module introduces the basic principles and concepts of an assessment and evaluation of transport and logistic systems. The interrelation between traffic and environment will be discussed.

Basics of Traffic Flow and Traffic Control
This module provides the students with theoretical knowledge of traffic flow. The main topics covered are: traffic stream models, car following and continuum theory for road segments, queuing theory for signalised and unsignalised intersections, etc.

Transport and Urban Planning
The module provides the basic knowledge about transport, mobility and urban planning. The main topics are: travel demand modelling, dependencies between supply and demand, relationships between transport and urban planning, etc.

Highway Design
Planning and design of safe, high efficient and sustainable road infrastructure linking cities needs the knowledge of the dynamic vehicle performance. Driver-Vehicle-Infrastructure interactions rule the geometrical design and the requirements for pavement works. This module also covers the construction and maintenance management of road infrastructure as well as environmental issues, e.g. noise.

Soft Skills
Excursion Practical Experience in Warehouse & Distribution

Logistics Specialisation

Core Modules

Introduction to Business Logistics
In-depth knowledge about Evolution of Business Logistics, key definitions, megatrends for the future of Logistics, model of logistical activities, logistical objects, cargo transportation, warehousing, operational, tactical and strategic levels of logistical planning, best practices and principles of logistical systems optimisation, future fields of logistics application

Decision Support for Logistics Management
Principles of management decision support, overview on relevant operations research tools and algorithms. Principles of modelling logistical systems (data collection issues).

Introduction to Supply Chain Management
Students are able to interpret and apply: SCM for fully automated processes; transport systems; airport logistics; harbour logistics; courier & express logistics; Third Party logistics; planning methods; design of systems & project management

Cross-Discipline Modules
Business & Technical English, Selected Topics in Business Management, Aspects of European and Asian Relations Today, Selected Topics in Business Administration

*Specialised Modules *(Choose 4 modules from the list below and 1 from Transport's specialised modules)*

Industrial Logistics
The lecture covers the issues of logistics and supply chain management from the perspective of global industrial producers and suppliers, such as from the electronics, electrical appliances, automotive, machinery industries ("assembly industries").

Consumer Industry Supply Chain Management
This lecture addresses the issues of logistics and supply chain management from the perspective of national and international consumer goods producers, wholesalers, retail chains and direct marketers, such as from the food and non-food branded goods industries, fashion and luxury goods, home supplies etc.

Logistics Service Provider (LSP) Management
This lecture focuses on the "life cycle" issues of logistics service provider. Management such as market selection and analysis, as well as transport mode choices. Overview of the important LSP markets, such as parcels/express, LTL, truckload, air and seaway forwarding, container shipping, etc.

Health Care Logistics
Aim and scope of this course are the special aspects of logistics and supply chain management in the health care industry. This course offers an introduction to the fundamentals of health care management. Furthermore students learn to understand the basic mechanisms of the health care value chain, develop a sound knowledge of appropriate tools and techniques, management of supply chain, management activities and learn how to evaluate logistic processes in this special field of application.

Green Supply Chain and Risk Management
Students are able to understand the business model of Green Supply Chains and are able to implement green techniques for company short and long term. In addition, students are able to evaluate the threats and for increasing risks in Global and local supply chains. Lastly they can operate risk mitigation and avoidance techniques to deepen their understanding from Supply Chain Management

Design and Application of Material Handling Systems
Material Handling is shown in many business areas and business cases (logistics processes in transport modes like Air traffic, Harbour logistics, Warehouse and Distribution, Express logistics, LSP-business and production logistics). Furthermore an overview about general contractor business and Project Management is given.

Transport Specialisation

Core Modules

Introduction to Business Logistics
In-depth knowledge about Evolution of Business Logistics, key definitions, megatrends for the future of Logistics, model of logistical activities, logistical objects, cargo transportation, warehousing, operational, tactical and strategic levels of logistical planning, best practices and principles of logistical systems optimisation, future fields of logistics application

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Cross-Discipline Modules
Business & Technical English, Selected Topics in Business Management, Aspects of European and Asian Relations Today, Selected Topics in Business Administration

*Specialised Modules *(Choose 4 modules from the list below and 1 from Logistics' specialised modules)*

Traffic Operation and Control (ITS)
The module provides insights into the state-of-the-art control measures for optimising traffic flows. The main topics are: the principles of urban, extra-urban and integrated systems, the objectives, measures, methods and algorithms, systems and technologies used in intelligent transportation systems, etc.

Transportation Modelling and Simulation Tools
The module provides detailed knowledge about software tools for traffic and system simulation. Microscopic and macroscopic simulation will be dealt with in this lecture.

Module Synopsis

Public Transport Planning
The students will learn how to plan and operate different public transport modes. The main topics are: the geometry of transit lines, transit network types and their characteristics, public transport scheduling, transit fares, etc.

Airport and Harbour Design
This module gives an insight into the necessary components of airports and harbours and the planning processes for developing these sites. Besides that it offers several methods for operating airports and harbours.

Rail Transport and Rail Planning
The module covers freight and passenger rail-transport systems focusing on infrastructure planning. The required track alignment tools are introduced based on the kinematic and dynamic features of rail vehicles, the specific train-track interactions, the passenger comfort and the safety requirements. This includes turnouts, junctions and other track configurations for rail network and station design. The students will learn the design, construction and maintenance of rail infrastructure as well as the subsystems and components for conventional and high-speed lines.

Urban Road Design
Provides in-depth knowledge on planning, designing and organizing urban streets as spaces for living, furthermore looking at different ways to organise transportation in an efficient way for various transport modes and mobility needs.

Railway Engineering Specialisation
Core Modules
Rail Transport and Rail Planning
The module covers freight and passenger rail-transport systems focusing on infrastructure planning. The required track alignment tools are introduced based on the kinematic and dynamic features of rail vehicles, the specific train-track interactions, the passenger comfort and the safety requirements. This includes turnouts, junctions and other track configurations for rail network and station design. The students will learn the design, construction and maintenance of rail infrastructure as well as the subsystems and components for conventional and high-speed lines.

Trackworks I
This module provides in-depth knowledge of the forces acting between vehicle and track and of the environmental actions. Students learn the strategies and the tools to design track systems, to analyse and to evaluate track performance with respect to maintenance and safety requirements. Beside track stability, the track quality and track stiffness are of significant importance for high-speed railway lines. Conceptual design of upgraded conventional and ballastless track systems will be discussed too.

Trackworks II (Urban Rail Focus)
This module covers the special features of urban rail systems, especially metro and tram. The specific train-track interactions, track layout and infrastructure design will be discussed. Noise and vibration requirements rule the rail infrastructure and track design in the urban environment. Students will learn the design of floating slab tracks and the application of other measures to minimise the negative effects of urban rail infrastructure. Acceptance and attractiveness of surface rail transport can be enhanced by an integrated infrastructure design (e.g. by green tracks).

Public Transport Planning
The students will learn how to plan and operate different public transport modes. The main topics are: the geometry of transit lines, transit networks types and their characteristics, public transport scheduling, transit fares, etc.

Train Control and Signalling Systems
This module introduces to the students the train control and signalling systems. The benefits and challenges of techniques used will be analysed. Turnout, signals, and all track based equipment, facilities, electronic interlocking and train control systems will be covered too.

Risk analysis and assessment of electronic systems and management of train scheduling and transport risk will be discussed.

Rolling Stock
This lecture covers the wheel-rail interaction, running behaviour in curves and straight track, propulsion systems diesel, electricity AC and DC, energy efficiency including regenerative braking, running gear and vehicle construction, including primary and secondary suspension devices, wheelsets, bogie frames and body shells relevant norms and design rules, tendering procedure and homologation process, safety issues as collision safety derailment safety, fire safety, environmental aspects as external and internal noise, particle emission, space consumption, reliability, availability, maintainability, diagnosis systems and their environment and benefit.

Traffic Operation and Control (ITS)
The module provides insights into the state-of-the-art control measures for optimising traffic flows. The main topics are: the principles of urban, extra-urban and integrated systems, the objectives, measures, methods and algorithms, systems and technologies used in intelligent transportation systems, etc.

Transportation Modelling and Simulation Tools
The module provides detailed knowledge about software tools for traffic and system simulation. Microscopic and macroscopic simulation will be dealt with in this lecture

Soft Skills
Cross-cutting fundamentals and methods

*Specialised Modules** *(Choose 2 to 4 modules from the list below. Each student must accumulate 11 credits)*

• Civil Engineering in Energy Technology
• Energy Systems and Energy Economy
• Power Transmission Systems
• Local Public Transport Strategy and Organization
• Geo Information
• Land Use and Transport (Strategies and Models)
• Road Design
• Computer Aided Traffic Engineering with Matlab
• Urban Infrastructure Design
• Strategies in Megacity Regions and Developing Countries

**Disclaimer: Specialisation modules available for selection are subject to availability. Unforeseen circumstances that affect the availability of the module include an insufficient number of students taking up the module and/or the unavailability of the professor. TUM Asia reserves the right to cancel or postpone the module under such circumstances.
**Students who are specialising in Railway Engineering are required to complete the following modules at TUM's main campus in Munich.*

Admissions Information

ADMISSION CRITERIA*

- Hold a relevant Bachelor's Degree or its equivalent in any of the following areas (but not limited): *Civil Engineering, General Engineering, Economics.*

- Submit **one (1) notarised copy of Official or Provisional Bachelor Degree Certificate**** and **one (1) notarised copy of Official or Provisional Academic Transcript****

- Submit **two (2) Recommendation Letters** from two (2) different Professors or Employers

- Submit **one (1) A4-page Letter of Motivation** that indicates the reason(s) you are interested in the programme you applied for

- Submit **one (1) Curriculum Vitae / Resume**

- Submit **one (1) Passport-sized photograph**** and **one (1) Passport Biodata Page photocopy** (the passport page with your personal particulars)

- **TOEFL / IELTS** (Required for applicants whose native tongue or medium of instruction from previous studies is not in English)

- **Akademische Prüfstelle (APS) certificate** (Required for applicants who hold a degree from China, Vietnam, or Mongolia)

> TOEFL Requirements: Minimum 605 for the Paper-Based test / 234 for the Computer-Based test / 88 for the Internet-Based Test
> IELTS Requirements: Overall IELTS results of at least 6.5

Important: Documents that are not in English must be translated by a certified translator

*Find out about the full application process on www.tum-asia.edu.sg/application-process

**All applicants are required to submit an additional of two (2) notarised copies of Official or Provisional Bachelor Degree Certificate, two (2) notarised copies of Official or Provisional Academic Transcript, and two (2) passport-sized photographs when you have accepted the offer of admissions and are being matriculated into our programme

TO APPLY

Applications open 15th October every year. Apply online at www.tum-asia.edu.sg.

TUITION FEES

APPLICATION FEE	PAYMENT OF TUITION FEES
S$79 (inclusive of GST) or Euro 52 is payable for each application per programme	**A Total of Euro 19,000*** Tuition fees includes teaching fees, examination fees, internet access on campus, and cost of mandatory events. Expenses excluded from this fee and to be borne by students include: airfare, accommodation, and living expenses. The tuition fee will be paid in 3 installments. *Please note that the tuition fees indicated do not include the expenses for the additional 6 month semester (for Railway Engineering) in Munich, Germany.*

* Tuition fees are accurate as of 1 October 2016. Tuition fees are subject to revision due to currency fluctuations, at the discretion of TUM Asia. Fees quoted are inclusive of 7% Singapore's Government Goods & Services Tax. Please refer to www.tum-asia.edu.sg/MScfees for the latest tuition fees.

Studying at the Technische Universität München Asia
"Talents Are Our Assets, Reputation Is Our Return"

Entrepreneurial Thinking and Engagement

Globalization is now an inevitable force that is here to stay. At TUM Asia, our classroom reflects this diversity with an enrolment of over 28 nationalities. This means that we foster a vibrant learning environment where the student learns not only from the textbook but also through the lives of their counterparts. Classroom ideas are synthesized across the diverse economic realities and students learn to see from multiple vantage points, creating a capacity to solve problems in creative ways. The unique 18 month degree equips the student with not only technical and scientific knowledge, but with an enriched curriculum composed of business and cultural modules.

TUM CREATE - Centre for Electromobility

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 of research in Singapore. TUM Create is a joint programme between Technische Universität München (TUM) and Nanyang Technological University (NTU). The electromobility institute brings together the expertise and innovation of Germany and Singapore, to drive innovation to shape the future of sustainable mobility by tackling issues ranging from the molecues to the megacity. **Graduates from the TUM Asia Master programmes have the opportunity to apply for positions at TUM Create, especially if your interest lies in research/electromobility**.

## Highest International Standards

You will be studying with the world's best professors from TUM, as well as experts from the industry. Not only will the student benefit from professors who are actively involved in research, one will also receive a holistic learning experience with the engagement of local lecturers from academia and industry. Majority of our modules are covered by professors who fly in from Germany on an exclusive teaching basis, to ensure that students get the undivided attention of their lecturers.

TUM Asia's Transport & Logistics programme, with its multi-cultural atmosphere, prepares students for international careers in the wide field of transport and logistics. Focusing on strategies, topic-interactions and creativity, the students are able to develop skills to successfully lead multi-disciplinary projects.

Dr. Bernhard Lechner
Senior Researcher & Lecturer at Technische Universität München, Collaborating Scientist at TUM CREATE

DID YOU KNOW THAT SINGAPORE IS THE PREFERRED LOGISTICS & SUPPLY CHAIN MANAGEMENT HUB FOR LEADING MANUFACTURERS DUE TO EXCELLENT GLOBAL CONNECTIVITY?
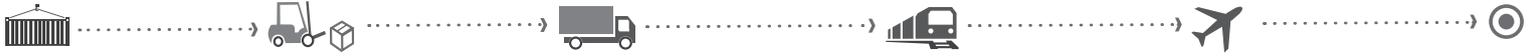
Heart of Southeast Asia: Singapore's Strategic Location

Singapore's strategic position on the crossroads of the world and at the nexus of major shipping lanes has earned it the reputation of being a important logistics hub and conduit for world trade. Singapore is well-positioned to help logistics companies build on their manufacturing leadership and develop higher value adding services. More than 178 kilometers of track span across the island, connecting 128 stations on 5 Mass Rapid Transit (MRT) and 3 Light Rail Transit (LRT) lines. Together, over 2.8 million trips are made daily across Singapore's rail network. Furthermore, Singapore is the leading aviation hub, a world class integrated chemical hub, and has a robust electronics industry. Therefore, Singapore's demand for an efficiently structured and managed transportation and logistics system will only continue to grow.

The Transport & Logistics Industry in Singapore

Singapore is the leading Transportation & Logistics hub in the world. Singapore's global connectivity and its secure and business-friendly import/export procedures provides companies greater efficiencies in conducting business. Singapore provides 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 Changi International LogisPark, which facilitates regional distribution, and the Banyan LogisPark on Jurong Island that caters to chemical and oil companies.

Our Graduates

- Our graduates in Transport & Logistics are employed all over the world, such as in **Singapore (95.2%), Europe (4.8%)**

- The most commonly accepted positions are **Air Freight Analyst, Logistics Analyst, Transport Analyst,** and **Import & Export Coordinator**

- Our graduates are expected to to be able to find job opportunities with **DHL, Pan Asia Logistics, RedMart**. In the past year, Pan Asia Logistics hired **23.8%** of our total graduates

1 The World Bank ranked Singapore as the #1 Logistics Hub amongst 155 countries globally in the 2012 Logistics Performance Index

2 Singapore's Changi Airport is one of Asia's largest cargo airports and handles close to 2 million tonnes of cargo annually

7 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

20 Singapore is a prime location for major logistics firms, with 20 of the top 25 global logistics players conducting operations in Singapore

31 Singapore is one of the world's busiest transhipment hub, handling about 1 out of 7 of the world's container transhipments; more than 31 million TEUs of containers in 2012

123 Singapore is connected by 200 shipping lines to 600 ports in 123 countries

> **TUM Asia, combining the tradition in education and the dynamics of one of the most important hubs in Asia, does provide students with the skills and exposure needed for the successful realization of their dreams and ambitions!**

Kalin Stoyanov
Alumni, Master of Science in Transport & Logistics Planning and Control, Rolls-Royce

Ambitious, motivated, open-minded & hardworking - this is how the TUM Asia graduates are excellently contributing to live up to Pan Asia Logistics' core values: Knowledge driven, Integrity, Personal Relationship and Service Excellence.

Pan Asia Logistics Singapore Pte Ltd

TUM Asia

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+ As rated by Academic Ranking of World Universities (Shanghai Ranking) 2011-2013, 2016 and 2015 QS World University Ranking
^ As ranked in the 2014 Global Employability Survey by The New York Times
# As ranked by Academic Ranking of World Universities (Shanghai Ranking) 2013 and 2013/2014 QS World University Ranking