



TUM Asia

**STUDENT EXCHANGE PROGRAMME:
STUDY TUM AEROSPACE ENGINEERING
MASTER'S MODULES
IN**

Singapore

**EXPERIENCE INTER-CULTURAL LEARNING:
IN-PERSON, 2-WEEK BLOCK COURSES AT THE
ASIAN CAMPUS OF TUM**



The Singapore Experience

Study abroad at TUM's one and only overseas campus, TUM Asia, where you get to widen your horizons and acquire essential soft skills while gaining a deeper knowledge in Aerospace Engineering that TUM has to offer. At Singapore, be it the swanky architecture, diverse culture, lush greenery or tropical weather, there are many reasons why people choose to visit Singapore as a choice of destination.

Aerospace City of the Future

Known as the "Aerospace City of the Future"*, Singapore boasts one of Asia's largest and most diverse eco-systems: playing host to a growing satellite industry with more than 30 firms, including SES and Inmarsat and space start-ups like Astroscale. Lauded for its developed infrastructure, political stability, open business policies, skilled workforce and the use of English as the main working language, Singapore is the top choice for multinational companies and start-ups to set their business here as a springboard to tap into emerging markets.



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aerospace players. Singapore has one of the largest and most diverse aerospace companies in Asia.

*Source: <https://www.edb.gov.sg/en/our-industries/aerospace.html>



Culture

A melting pot of diverse cultures and races

From a tiny swamp-covered island, Singapore quickly grew as a major entrepôt. Despite being home to a motley of cultures, ethnicities and religions with various festivities, traditions and practices, Singaporeans are often seen celebrating them as one people. Ranked as one of the most religiously diverse country in the world, Singapore's strong religion tolerance is largely attributed to its success of policies put in place to ensure religious harmony, such as the Maintenance of Religious Harmony Act, and other softer measures, to encourage religious understanding.

Cuisine

A gourmet paradise of irresistible local cuisine and fine-dining

Whether you are craving for new flavour sensations or seeking multisensory dining experiences, Singapore's food scene is bustling with culinary adventures not to be missed. One can relish in authentic hawker fare where it is not only cheap and accessible, some of them had even earned their Michelin stars with their savoury signatures. In addition, you can get to experience favourite celebrity chefs' creations at dining establishments like Gordon Ramsay's Bread Street Kitchen, Cut by Wolfgang Puck and all.





Aerospace Engineering

Master's Modules

Held as a two-week block course conducted in person by TUM Professors, the scope of the master's module corresponds to 5 ECTS, of which about 45 hours are spent with the Professors in the classroom followed by an examination.

Advanced Flight Control Systems

This module conveys complex control concepts for aircraft. In addition, the C*-criterion is derived and modern concepts of adaptive control in aviation are presented.

Lecturer: Prof. Florian Holzapfel

ECTS: 5

Starts Aug / Sep

Aerodynamic Design of Turbomachinery

This module covers the various types of turbomachinery applications with particular emphasis on compressors. Starting from the fundamental equations in fluid dynamics, the working principles of turbomachinery are derived. Moreover, main components, characteristics and associated flow phenomena are explained. For compressors, design methods and processes, topics of operability and stability enhancement are covered.

Lecturer: Prof. Volker Gümmer

ECTS: 5

Starts: Mar / Apr

Aeroelasticity

This module describes basic aeroelastic phenomena arising from the mutual interaction of elastic, aerodynamic and inertial forces on a structure, with special emphasis on problems related to fixed wing vehicles. Aeroelasticity plays a major role in the design, qualification and certification of flying vehicles, as it contributes to the definition of the flight envelope and affects various performance indicators.

Lecturer: Prof. Carlo Bottaso

ECTS: 5

Starts: Feb / Mar



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Aerospace Structures

This module introduces the approaches for the development process of lightweight and aerospace structures, including design, simulation, optimisation and testing aspects. Current structural design concepts for aerospace applications are shown in the context of goals and requirements to be achieved. Possible future developments are addressed and reasons are discussed.

Lecturer: Prof. Horst Baier

ECTS: 5

Starts: Sep / Oct

Aircraft Design

This module covers various current design methods & relevant design tools for the applied design of surface aircraft. With the simultaneous introduction to the aircraft design system, students are enabled to design both individual components of the aircraft with regard to the overall aircraft, and define the overall aircraft configuration so that it complies with the current requirements with regard to safety, safety and security economy, comfort, the environment and the performance of flights.

Lecturer: Prof. Mirko Hornung

ECTS: 5

Starts: Aug

Boundary Layer Theory

This module covers basic phenomena present in boundary-layers. Physical models and the derivation of the boundary-layer equations from the Navier-Stokes equations are discussed for flat 2-dimensional cases. Temperature, compressible and 3-dimensional boundary-layers are explained. The stability theory explains the laminar-turbulent transition, turbulent boundary-layers and experimental research methods.

Lecturer: Prof. Dr.-ing. Habil. Christian Stemmer

ECTS: 5

Semester: Mar / Apr



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Fibre Composite Materials

This module introduces the main properties & design principles of fibre composite materials and calculation methods. Focusing on Carbon fibre polymers, other types of fibres and matrix materials, failure criteria and behaviour under environmental influences, carbon fibre specific fabrication and manufacturing methods, parameter processing, design and material testing steps will be covered.

Lecturer: Prof Horst Baier

ECTS: 5

Starts: Jan / Feb

Flight Control Systems

This module introduces the basic operating principle of flight controls. Based on the non-linear equations of motion of airplanes and basic control theory principles, control strategies are derived in order to improve the handling qualities or stability of airplanes. In addition, strategies for the implementation of autopilots are presented.

Lecturer: Prof. Florian Holzapfel

ECTS: 5

Starts: Feb / Mar

Helicopter Engineering

The content extends over different design requirements and their classification, the sizing process, evaluating the flight performance with respect to power consumption, rotor craft limits and mission design. Additionally, the lecture will cover tools for the cost and weight estimation of the designed rotorcraft.

Lecturer: Prof. Manfred Hajek

ECTS: 5

Starts: Oct / Nov



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Safety and Certification of Aircraft

This module covers Aviation Safety Principles, Basics in Regulations, Airworthiness Code (CS-27, CS-29), Loads, Stress & Fatigue, Performance Categories, Safety Analysis & Flight Accident Investigation. During the presentation of the basic chapters of flight safety and certification the students have the possibility to discuss the important aspects together with the professor. The module covers following chapters such as Aviation Safety Principles, Basics in Regulations Airworthiness Code (CS-27, CS-29), Loads, Stress and Fatigue, Performance Categories, Safety Analysis, and Flight Accident Investigation

Lecturer: Prof. Manfred Hajek

ECTS 5

Starts: Oct / No

Safety and Certification of Avionics and Flight Control Systems

This module addresses the certification process of avionics and flight control systems in commercial aviation. The focus of this lecture lies in safety analysis methods, taking common approaches of their employment in development projects of safety-critical systems in the industry into account. The course begins with giving a general overview of the development and certification of flight control systems, along with the contents of relevant development standards and recommended practices and the resulting process structure. Based on this, profound knowledge of the process and methods of safety assessment of complex technical systems in aircraft is conveyed.

Lecturer: Prof. Florian Holzapfel

ECTS: 5

Starts: Feb / Mar

Spacecraft Technology

This survey class of astronautical and space engineering topics presents the relevant theoretical background and engineering design methods to find suitable solutions for spaceflight and spaceflight technology. The module will be following the processes and technologies from launch (physics of spaceflight, rockets, propulsion, trajectory, spaceflight environment) to orbit with topics in physics (orbital mechanics and dynamics, interplanetary flight, navigation) and engineering subsystem technologies (power, thermal, communication, sensors, actuators). The topics and processes will be presented with practical applications in mind.

Lecturer: Prof. Ulrich Walter and Dr. Martin Rott **ECTS:** 5

Starts: Apr / May



TUM Asia

The one and only overseas campus of TUM

German engineering at the technology hotspot of Southeast Asia: TUM Asia is the only overseas campus of the Technical University of Munich (TUM) in Singapore. In 2002, it was the first branch of a German university set up abroad, combining German engineering with Asian relevance in its teaching. Many of TUM Asia's graduate students are international students who have stepped foot into Singapore for the first time. Take time to explore this amazing island with your classmates who come from various corners of the world and discover the real side of Singapore.

Administration Information



ELIGIBILITY

We seek your kind understanding that only matriculated student can apply.



FEES

SGD1,800 per module
(inclusive of goods and services tax)



MORE INFORMATION & APPLICATION

For more information, please email us at admission@tum-asia.edu.sg.
We will get in touch with you shortly.





TUM Asia
www.tum-asia.edu.sg