SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING (MAE)

• Bachelor of Engineering (Mechanical Engineering)
• Bachelor of Engineering (Aerospace Engineering)
The School of Mechanical and Aerospace Engineering, one of the three pioneering schools of Nanyang Technological University, stands firm on the fundamentals of mechanical and aerospace engineering, while steadily building its strength on teaching and research.

In teaching, engineering fundamentals form the core but our curriculum allows students to broaden their scope through electives they can freely choose in areas of their interest. Lectures, with the assistance of on-line learning technologies, are the central platform of delivery. But our students are frequently challenged and stretched through projects, many of which they have to define, discover the problems and then solve themselves. For example, our students design and build their own energy efficient cars, and then participate in races such as the Shell Eco-Marathon, where they have consistently done very well over the years, bringing pride and glory to themselves, the School and the University.

In research, we have attracted large grants that allow us to establish research centres on areas of current interest to the industry and Singapore. These areas include 3D Printing, Aerospace Engineering, Air Traffic Management, Naval Architecture and Marine Engineering, Optical Engineering, Remanufacturing, Robotics and Intelligent Systems and Sports Research. These grants enable us to strengthen our research and work with industry partners. Very importantly, they are also the vehicle for us to bring front-line industry problems to the classroom, exposing our students to deep relevant issues and, in many cases, involving them in solving the problems as well. Beyond that, some of our faculties and even our students have taken their research further and commercialise them through spin-off companies.

To deliver the best education, we need good professors. We spare no effort in recruiting the best minds from well-respected institutions around the globe. As a result of getting in the best and brightest professors, the quality of our intake has been getting better over the years as more top students join us. However, the real measure of our achievements is the graduate employment figures, which see a large majority of our students gaining employment within three months of their graduation, and many well before. Many of our alumni are now in senior positions in their organisations or leaders in their fields.

We build our students not just to be good engineers, but wholesome human beings, creative and ready to face challenges head on. Our graduates are clearly the wealth and value creators of the future. I invite students wholeheartedly to join the school of MAE, so that together we can build a better future for all.
Ranked 13th in the 2016 QS World University Rankings by subject, the School of Mechanical and Aerospace Engineering (MAE) is the home ground of outstanding graduates with highly fulfilling careers in major engineering industries and leading financial institutions.

WHY NTU MAE

WHAT?
Exciting projects including world’s first flexible endoscope with small robotic fingers, solar cars, 3D printed parts and UAV that fly using GPS

HOW?
Versatile curriculum equips students with technical know-how, excellent communication skills and leadership qualities

WHERE?
Pursue a career in marine & offshore, oil & gas, aerospace, robotics, nanotechnology and more

WHO?
Partnerships with important industry players including Rolls Royce, Leonardo-Finmeccanica, Civil Aviation Authority of Singapore and Sembcorp Marine amongst others

Student Life @ MAE
A myriad of exciting activities awaits you at MAE!

“There’s nothing I believe in more strongly than getting young people interested in science and engineering, for a better tomorrow, for all humankind.”

- Bill Nye
The aerospace industry in Singapore encompasses a broad spectrum of activities that include aircraft maintenance, repair and overhaul (MRO), air transportation management and logistics, manufacturing and research & development.

Being a global aviation hub, Singapore will see a vast increase in air traffic in the near future, hence the need for the fourth passenger terminal and an additional runway. CAAS has built a $72 million research centre at MAE to further develop its air traffic management capabilities and ensure the safe and smooth arrival of flights in and out of Singapore.

**DID YOU KNOW?**

Our two-storey-high and 13-metre wide control tower simulator at ATMRI, MAE, which provides a 360-degree-view, is one of the largest air traffic control towers for research purposes in the world.
Over the years, mechanical engineering has grown from producing basic functional products to advanced technology-based items that are smaller, smarter and ‘greener’. We are mindful of the changing trends and have kept our curriculum constantly relevant.

Mechanical engineering has been described as the ‘mother of all engineering’, and rightly so because of its all-encompassing nature. The specialisations within MAE reflect the diverse nature of the discipline and are testament to MAE’s comprehensive approach to mechanical engineering teaching and research.

Areas of Specialisation

- In-Depth
  - Design Stream
  - Robotics and Mechatronics Stream

- Main Stream
  - Aeronautical Engineering
  - Energy & Environment
  - Naval Architecture & Marine Engineering
  - Manufacturing Engineering
  - Systems Engineering
Students under the main stream will learn about the classical mechanical engineering fundamentals that spans across materials, mechanics, thermodynamics, heat transfer, control, design and advanced manufacturing. Opportunities for students to do a specialisation of their interests in their final year of studies will be provided.

Majority of mechanical systems today are controlled by electronics. The multidisciplinary nature of this mechatronics involves the integration of mechanical systems with electronics, computers and control theories. Students under the robotics and mechatronics stream will be able to create new systems or products that will outperform purely mechanical ones.

In joint collaboration with NTU School of Art, Design and Media (ADM), the design stream emphasises on the combination of creativity, technology and design methodology with a concern for human values and the needs of society.
ADMISSION REQUIREMENTS

GCE ‘A’ level
- Pass in H2 Level Mathematics, and
- Pass in H2 Level Biology/Chemistry/Computing/Physics, and
- Pass in H1 Level/’O’ Level Physics or equivalent (Pass in ‘O’ Level Physics is only applicable to applicants who have not read H2 Level Physics)

Local Polytechnic Diploma
- Polytechnic graduates with relevant diplomas in engineering and good ‘O’ Level results
- Exemplary academic records may be granted course exemptions accelerating their course of study.

International Baccalaureate (IB)
- Mathematics at higher level, and
- Physics/Chemistry/Biology/Computer Science at higher level, and
- Pass in Physics at Standard Level or equivalent (only applicable to applicants who have not read Physics at Higher Level)

NUS High School diploma
- Major CAP of 2.0 in Mathematics, and
- Major CAP of 2.0 in Physics/Chemistry/Biology, and
- Overall CAP of 2.0 in Physics or equivalent

For detailed admission requirements and application, please visit: http://admissions.ntu.edu.sg
AEROSPACE ENGINEERING CURRICULUM

YEAR 1
- Aerospace Discovery Course
- Introduction to Aerospace Engineering
- Engineering Communication I
- Dynamics
- Mathematics I and II
- Computing
- Mechanics of Materials
- Introduction to Thermo-fluids
- Engineering Graphics
- Engineering Mathematics
- Thermodynamics
- Aerospace Materials and Manufacturing Processes
- Flight Performance
- Laboratory Experiments

Engineering Innovation and Design

YEAR 3
- Heat Transfer
- Fluid Mechanics
- Aircraft Structures I
- Aerodynamics
- Aircraft Propulsion
- Flight Dynamics
- Aircraft Electrical Devices
- Aerospace Control Theory
- Engineers and Society

20 weeks of Professional Internship

- Aircraft Design I
- Aircraft Structures II
- Aeroelasticity
- Aircraft Navigation and Flight Computers
- Engineering Communication II
- Major Prescribed Electives 1 and 2
  - Operations Research
  - Computational Fluid Dynamics
  - Mechanics of Composite Materials
  - Non-Destructive Testing
  - Aircraft Reliability and Maintainability
  - Unmanned Aerial Vehicles

Final Year Project
MECHANICAL ENGINEERING CURRICULUM

- Fundamental Engineering Materials
- Dynamics
- Engineering Communication I

3 Specialised Streams
- Mainstream
- Design Stream
- Robotics and Mechatronics Stream

- Mechanics of Materials
- Theory of Mechanism
- Introduction to Thermo-fluids
- Manufacturing Processes
- Engineering Graphics
- Engineering Mathematics
- Introduction to Electrical Circuits and Electronics Devices
- Laboratory Experiments

Engineering Innovation and Design

- Machine Element Design
- Solid Mechanics and Vibration
- Mathematical Methods in Engineering
- Control Theory
- Fluid Mechanics
- Mechanical Experiments
- Engineers and Society

20 weeks of Professional Internship

- Engineering Communication
- Major Prescribed Electives 1, 2, 3 and 4

5 Specialisations (For Mainstream Students)
- Aeronautical Engineering
- Energy and the Environment
- Manufacturing Engineering
- Naval Architecture and Marine Engineering
- Systems Engineering

Final Year Project
Hands-on learning

The new hands-on learning programme is a six-hour compulsory module for MAE second year students to gain practical experience and be proficient in operating and performing machining tasks independently.

Engineering Innovation Design (EID)

The concept of technopreneurship is introduced to students through the EID programme. Under the guidance of mentors, second year students are required to propose team-based projects, plan, and develop their very own product prototype before pitching their ideas to a panel of judges that include industrialists and venture capitalists.

"Nothing will test the students’ knowledge better than real-life applications. The competition gives them the opportunity to generate ideas as a team and contemplate the business viability of their product."

Associate Prof Rajesh Piplani, EID Chairman

The anti-bedsore bed is specially designed to rotate at three different angles (0°, 30°, 60°) and is lined with breathable latex for better air circulation around the body. This prevents accumulation of pressure at any point, reducing the occurrence of bedsores.

Zwitch! is a product that integrates form with function. The single multi-functional water bottle comes with interchangeable functional units to suit the many lifestyle needs of the busy modern citizen.
URECA is a university-wide programme initiated to stimulate a culture of research among the top undergraduates. It aims to provide these undergraduates with a good appreciation of research (its open-endedness, the need for rigour and independence, etc.) and the approaches towards research problems. Academically outstanding second and third year students are invited to undertake research from a choice of more than 800 research projects ranging from engineering, biosciences, communications, business management, accountancy and humanities.

Final Year Project (FYP)
After selecting their chosen project which entails an in-depth study and thorough investigation, all final year students are required to submit a project plan, detailed reports and complete an oral presentation.

Product Development Challenge (PDC)
PDC is a platform for students to take on an open-ended teamwork project to develop products such as a race car or a football playing robot, and have the opportunity to compete internationally.

The NTU Venture 8 (right) and NTU Venture 9 (left) bagged a total of six awards, turning in Singapore’s best performance ever. NTU Venture 8, Singapore’s first 3D printed urban solar electric car, won three off-track awards in the Vehicle Design, Communications and Safety categories. It also finished third in the Urban Concept (Battery Electric) category and has been selected to be among five teams to compete in the coveted Shell Driver’s World Championship in London. NTU Venture 9 also finished third in the Prototype (Electric Battery) category and bagged the Technical Innovation Award.

URECA is a great platform that allows me the freedom to find my path towards what I truly want to do in the future. I’ve benefited so much from it in my second year that I’m taking it again.

Josephine Monica
Mechanical Engineering
Year 3 undergraduate

TESTIMONIAL
Johnson & Johnson is one of the largest healthcare companies in the world. I am glad to work in the Supply Chain department as it is one function where communication and technical skills meet. My main project in Johnson & Johnson is to manage, review and optimize $190M USD inventory in Asia Pacific region. This position requires me to liaise and work with many people in Asia Pacific countries and also in Global side. One of the accomplishments is that as a team, we managed to optimise the inventory and reduced the inventory value by 20%! Through the internship, I learn how the Supply Chain function works and interact with others. Most importantly, I get to know my interest and realise that I really enjoy solving challenging cases which makes me learn a lot every day.

Steven Aditya
Mechanical Engineering, Year 3 undergraduate
Internship in Supply Chain department at Johnson & Johnson
In recognition of academic excellence and leadership potential, NTU offers a variety of scholarships to new as well as current students pursuing their full-time undergraduate studies. Scholarships are generally awarded to students based on academic merit and good co-curricular records.

**Nanyang Scholarships**

The Nanyang Scholarship, NTU’s foremost undergraduate scholarship, is awarded to outstanding freshmen pursuing undergraduate programmes. It recognises students who excel academically, demonstrate strong leadership potential, and possess outstanding co-curricular records.

The scholarship covers up to the normal programme duration on condition that the scholarship holder maintains a record of good academic performance and conduct satisfactory to the University.

*Subsidised tuition fees*  
*Living Allowance* SS$6,000 yearly  
*Book Allowance* SS$500 yearly  
*Accommodation Allowance* up to SS$2,000 yearly  
*Computer Allowance* SS$1,500 (one-off)  
*Travel Grant* SS$5,000  
*Priority for Overseas Programme*  
*Eminent Speaker Series*  
*Settling-in Allowance* SS$250 (one-off)  
*Bond-Free*

**College Scholarship**

The College Scholarship is awarded to outstanding freshmen pursuing full-time undergraduate programmes in NTU.

The Scholarship covers up to the normal programme duration on condition that the scholarship holder maintains a record of good academic performance and conduct satisfactory to the University.

*Subsidised tuition fees*  
*Living Allowance* SS$3,600 yearly  
*Bond-Free*

For more information on scholarships, please visit: [http://admissions.ntu.edu.sg/UndergraduateAdmissions/Pages/Scholarships.aspx](http://admissions.ntu.edu.sg/UndergraduateAdmissions/Pages/Scholarships.aspx)
Dr Warkiani’s work in the area of advanced microfluidics led to him being named as one of the top 10 innovators under 35 in the Asia-Pacific region by MIT Technology Review.

He undertook postdoctoral training at the Singapore - Massachusetts Institute of Technology Alliance for Research and Technology (SMART) Centre. There, he worked on the design and development of a novel microfluidic device to isolate and identify circulating tumour cells from blood for early cancer diagnosis. It has since been licensed to a multi-million dollar company in Singapore, and has attracted millions in funding for commercialisation purposes. The device is currently under clinical validations in cancer centres around the world.

NTU’s Aerospace Engineering programme, being the most established and recognised in Singapore, is one which has grounded me with a robust engineering foundation. During my semester-long internship at Rolls Royce, I saw myself transferring knowledge gained from the programme to creating valuable work for the organisation.

Furthermore, owing to NTU’s supportive culture, I have forged strong friendships that propelled me further in both my academic and non-academic pursuits. Importantly, being part of the University Scholars Programme has also stretched my intellectual capacity through exposure to liberal arts topics, complementing my engineering knowledge with broadened perspectives of the world.

MAE provides a stable environment for us to delve deeper into the aspect of engineering that we specialise in. In addition, we are exposed to subjects beyond engineering when we take a variety of other modules which range from Liberal Arts to Science and Technology. MAE’s friendly faculties are earnest in helping students in our pursuits, and complemented by the friendships forged here, learning is made a truly enjoyable and wholesome process.
Mr Teo is the Managing Director, President and Controlling Shareholder of ISDN Holdings Ltd – an integrated engineering solution provider principally focusing on motion control, industrial computing and other specialised engineering solutions, having been with the company since 1987. He had joined ISDN’s subsidiary Servo Dynamics Pte Ltd after obtaining his Bachelor of Engineering from the School of Mechanical & Production Engineering. In total, he has over 29 years of experience as an integrated engineering solution provider.

Mr Teo taps on his experience in all aspects of ISDN’s business to formulate corporate strategies and provide technical expertise to the organisation. He also plays an active role in procurement and marketing activities. Mr Teo has been instrumental in the Singapore Exchange Mainboard-listed company’s rapid growth – ISDN’s group revenue grew from approximately S$55 million in 2005 to S$236 million in 2015.