



**NANYANG
TECHNOLOGICAL
UNIVERSITY**
SINGAPORE



MAE



School of Mechanical and Aerospace Engineering

Power your Future and Take Flight with us



CHAIR'S MESSAGE

Professor Ooi Kim Tiow
Chair
School of Mechanical and
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 continuing to break new grounds in teaching and research. ”

As we stand on the cusp of the 4th Industrial Revolution and in an ever changing global economy, the school is committed to provide the very best education one can ever have.

In teaching, engineering fundamentals form the bedrock of our curriculum. Students are encouraged to broaden their scope and explore their interests through electives that they can freely choose. Lectures, with the assistance of on-line learning technologies, are the central platform of delivery. Our students are frequently challenged and stretched through projects as well, many of which they have to define, discover and solve problems independently. In addition, the school encourages our students to embrace the uncertainty in the global markets today and to cultivate a culture of lifelong learning through a plethora of hands-on workshops, invited talks with industry leaders as well as training sessions with our professional in-house career coaches.

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. Innovation is in our DNA, 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, the school is also home to the best minds from the top institutions around the world. We spare no effort in recruiting the best minds from well-respected institutions around the globe in order to give our students the best education they can receive. Our efforts serve to provide our students with a holistic education and to equip them with the right skillsets and knowledge that is future-ready. Our track record speaks for itself. Majority of our students secure 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 field.

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.

Be everything you've ever aspired to be

at NTU MAE



1st **11th**
in Singapore *in the world**

*According to QS World University Rankings® by Subject 2019.



Innovate!

NTU MAE is home to innovative projects that you can be a part of, such as the world's first flexible endoscope with small robotic fingers, solar cars, 3D printed parts, and unmanned aerial vehicles that fly and navigate using GPS.



Collaborate!

Our alliances with industry leaders keeps our curriculum and projects on the cutting edge, as we work with renowned partners such as Rolls Royce, Leonardo, the Civil Aviation Authority of Singapore (CAAS), Sembcorp Marine, and many others.



Grow!

We believe in moulding well-rounded graduates with the technical know-hows, communication skills, and leadership qualities to excel in professional careers. With our versatile curriculum, graduates can specialise in different fields, including marine & offshore, oil & gas, aerospace, robotics, nanotechnology, and more.

SCHOLARSHIPS



Nanyang Scholarships

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 in NTU. Scholarships are generally awarded to students based on academic merit and good co-curricular records.

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

Nanyang 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.



Travel Grant
S\$5,000 (one-off)



Priority
for Overseas Programme



Eminent Speaker Series



Settling-in Allowance
S\$250 (one-off)



Bond-free[^]



Subsidised Tuition Fees



Living Allowance
S\$6,000 yearly



Book Allowance
S\$500 yearly



Accommodation Allowance*
up to S\$2,000 yearly



Computer Allowance
S\$1,500 (one-off)

AEROSPACE ENGINEERING



The aerospace industry in Singapore encompasses a broad spectrum of activities. Being a global aviation hub, high air traffic growth in Singapore is expected with the operation of fourth passenger terminal and additional runways. To ensure the smooth flow of flights in and out of Singapore, CAAS has built a \$72 million research centre in School of MAE to develop its air traffic management capabilities.



Why choose Aerospace Engineering?

- Ranked as one of the top undergraduate programmes in Singapore
- The first and only full-fledged aerospace engineering degree in Singapore
- World class facilities

CAREER PROSPECTS

On graduating with a degree in Aerospace Engineering, you can look forward to a career in:

- ▶ Aerospace Consulting
- ▶ Air Traffic Management
- ▶ Aircraft Design and Manufacturing
- ▶ Aircraft Operations and Maintenance
- ▶ Aviation Regulatory Bodies
- ▶ Defence Systems and Management
- ▶ Finance and Banking
- ▶ Project Planning and Management
- ▶ Research and Development
- ▶ Teaching

...and many other (engineering and non-engineering) jobs

A seamless journey, from graduate to master's degree

Through train degree programme with École Nationale de l'Aviation Civile, (ENAC, University of Toulouse, France), one of the top aerospace Universities in Europe.

From NTU to ENAC

Pursue a **Private Pilot License** at ENAC

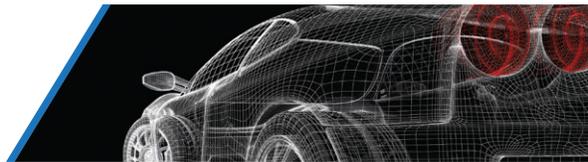
Paid **Internship Opportunities** in France

B.Eng (AE) + MSc. in 5.5 years

Your choice of **Master's Degrees**

- MSc. Aerospace Systems-Navigation and Telecommunications; or
- MSc. International Air Transport Operations Management

MECHANICAL ENGINEERING



Mechanical engineering has been described as the 'mother of all engineering', thanks to its all-encompassing nature. Over the years, the study of mechanical engineering has grown from producing basic, functional products, to designing advanced, technology-based items that are smaller, smarter, and greener than ever before.

The specialisations within MAE reflect the diverse nature of the discipline, and are testament to MAE's comprehensive approach to mechanical engineering teaching and researching. Additionally, our curriculum is constantly updated to match various industries' evolving trends, so NTU MAE graduates always have the most modern, relevant, and immediately applicable knowledge at their fingertips.

CAREER PROSPECTS

Graduates with a degree in Mechanical Engineering can expect strong prospects in these industries:

- ▶ Aeronautical Engineering
 - ▶ Biomedical Engineering
 - ▶ Clean Energy
 - ▶ Defence Organisations
 - ▶ Finance and Banking
 - ▶ Logistics
 - ▶ Manufacturing
 - ▶ Marine and Offshore Engineering
 - ▶ Mechatronics and Control
 - ▶ Power Generation and Distribution
 - ▶ Product Design
 - ▶ Project Planning and Management
 - ▶ Research and Development Robotics
 - ▶ Semiconductors
 - ▶ Teaching
- ...and many other (engineering and non-engineering) jobs



MECHANICAL ENGINEERING SPECIALISED STREAMS



Main Stream

Under the main stream, students learn essential mechanical engineering fundamentals – materials, mechanics, thermodynamics, heat transfer, control, design, and advanced manufacturing. In your final year of study, you can choose your preferred specialisation.

- **Aeronautical Engineering**
- **Energy and the Environment**
- **Manufacturing Engineering**
- **Naval Architecture and Marine Engineering**
- **Systems Engineering**
- **Smart Manufacturing and Digital Factory**

new

Robotics and Mechatronics Stream

Modern mechanical systems are controlled by electronics, making the combination of robotics and mechatronics disciplines a highly sought-after skill set. The multidisciplinary nature of mechatronics involves the integration of mechanical systems with electronics, computers, and control theories – and students in this stream will be able to create new systems that will outperform purely mechanical ones.

- **Machine Intelligence**
- **Mechatronics Interfacing Systems**
- **Mechatronics System Design**
- **Microprocessor Systems**
- **Real-time Software**
- **Robotics**

Design Stream

In collaboration with the NTU School of Art, Design and Media (ADM), the design stream combines creativity, technology and design methodologies, with a concern for human values and the needs of society.

- **Computer-aided Engineering**
- **Creative Thinking and Design**
- **Human Factors Engineering**
- **Industrial Design**
- **Product Design Engineering**
- **Product Development Management**
- **Product Presentation**



PROGRAMMES & ADMISSION REQUIREMENTS



Single Degree Programmes

- Aerospace Engineering
- Mechanical Engineering



Second Majors

- Aerospace Engineering with a Second Major in Business
- Mechanical Engineering with a Second Major in Business
- Mechanical Engineering with a Second Major in Society and Urban Systems

Double Degree Programmes

- Aerospace Engineering and Economics
- Mechanical Engineering and Economics

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/H1 Level Physics)

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)

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

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 (Only applicable to applicants who have not majored in Physics)

For detailed admission requirements and application, please visit: <http://admissions.ntu.edu.sg>



EXPERIENTIAL LEARNING



THE BEST WAY TO LEARN IS TO EXPERIENCE

Our students are given a myriad of opportunities to put theory to the test, ensuring that they are **industry-ready** even before they graduate.

Hands-on Learning



- 6-hour compulsory module in Year 2
- Practical experience in operating and performing machining tasks

Engineering Innovation Design (EID)



- Technopreneurship in action!
- Students are mentored to plan, produce and pitch a product prototype to an industry panel
- All year 2 students will be required to participate in EID

Undergraduate Research Experience on Campus (URECA)



- University-wide research programme for top undergraduates
- Over 800 research projects to choose from

Product Development Challenge



- Open-ended team project to define real-world problems and develop solutions
- Opportunity to participate in international competitions

Final Year Project (FYP)



- In-depth study and investigation of chosen project
- Develop project plan and detailed reports
- Deliver an oral presentation
- FYP is compulsory for all final year students

Engineering Innovation Design (EID)

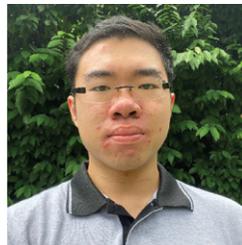
Project: Handle Safe

A 3D printed J-shaped mechanism for safe and easy laundry.



Product Development Challenge

Testimonial



Tan Zetus
Mechanical Engineering (Design)
Year 2 undergraduate
Nanyang Venture 10
(Hydrogen Fuel Cell Car)



As part of my Undergraduate Research Experience On Campus (URECA) project, I am leading a team of four to design and 3D-print a new motor for the Nanyang Venture 10 using Selective Laser Melting (SLM) technology. The design is aimed towards both aesthetics and efficiency while demonstrating new possibilities uncovered by SLM technology in manufacturing.

I appreciate how this project challenges me to explore various design techniques and be independently creative when modelling complex features. This project has also strengthened my analytical and observation skills. I also received the opportunity to put what I've learnt in school to practical use and gain experiential knowledge from my mentor, Assoc Prof Ng Heong Wah, at the same time. ”

AEROSPACE ENGINEERING CURRICULUM



- 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

01

YEAR

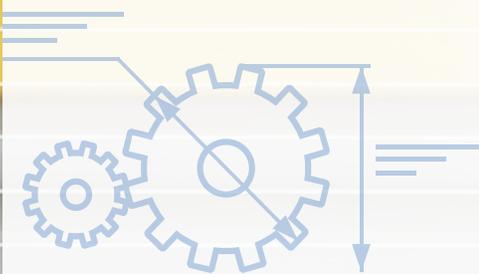
02

- Fundamental Engineering Materials
- Dynamics
- Engineering Communication I

3 Specialised Streams

- Mainstream
- Robotics and Mechatronics Stream
- Design 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



MECHANICAL ENGINEERING CURRICULUM



- 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

Specialisations

- Mechanical Engineering

new - Smart Manufacturing and Digital Factory

Final Year Project

YEAR
03

YEAR
04

- 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

6 Specialisations (For Mainstream Students)

- Aeronautical Engineering

- Energy and the Environment

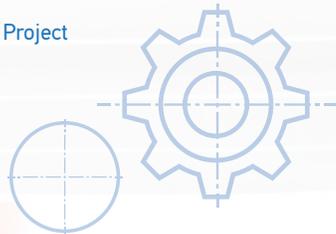
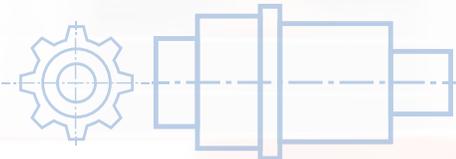
- Manufacturing Engineering

- Naval Architecture and Marine Engineering

- Systems Engineering

new - Smart Manufacturing and Digital Factory

Final Year Project



OVERSEAS EXCHANGE



Overseas Exchange Programmes are unique opportunities for students to read courses and/or to work overseas. Earned academic units will be counted towards graduation requirements!

These programmes give students once-in-a-lifetime experiences, including:

- International education experience
- Developing global perspectives
- Cultural immersion

STUDENT TESTIMONIAL

“ I was fortunate to have lived and studied abroad during my first semester of AY2018/2019. I embarked on an overseas exchange at VŠB-Technical University of Ostrava (TUO) in Ostrava, Czech Republic. ”



During my overseas exchange at TUO, I enrolled in modules that challenged my design skills and enhanced my engineering knowledge. As a Design Stream student, I picked up Autodesk AutoCAD, Inventor and Ansys Workbench. Through learning these software, I understood the process and requirements that modern engineers had to consider while carrying out rapid prototyping. This proved useful when I returned to Singapore for a management consulting internship at Accenture. I leveraged on my experience in using these software to recommend initiatives to C-level executives, providing tailor-made solutions to transform their businesses through long-term revenue growth and cost savings in the manufacturing industry.

I have always envisioned myself working in Europe and living in Ostrava was a stepping stone to my life-long dream. It was there where I made

many foreign friends from all parts of Europe and Asia. The school's Erasmus Student Network (ESN) Club was proactive in organizing many outings to bond the exchange students. These outings included sightseeing trips to mountains and casual meetups in the schools' nearby clubs.

Overall, the experience abroad have taught me independence. During my 4 months overseas, I've made several solo trips to countries like Germany and Slovakia, learning to cook my own meals at the same time. It was a truly rewarding experience and I look forward to return there in the near future.

Khoong Hong Li, Nicholas
Mechanical Engineering, Year 3, SEM 2
Undergraduate



INTERNSHIPS AND EMPLOYERS OF MAE



Our 20-week Professional Internship Programme builds on our belief that the best way to learn, is through experience. The programme is offered to third year students, and provides them with valuable work experience at a local company. Through their positive attitudes and performance during the programme, many students have been offered full-time employment – even before graduation!

Oh Shao Chong
 Engineering Product Line Manager
 Schlumberger Oilfield (S) Pte Ltd

Graduation Year, 2009
 Mechanical Engineering (Mechatronics Stream)

Graduation Year, 2010
 Singapore-MIT Alliance
 Master of Engineering in Manufacturing
 Master of Science in Manufacturing



▶▶ **Noor Mustikha**
 Mechanical Engineering,
 Year 3 Undergraduate

Internship at Embraer Asia Pacific
 (Commercial Aviation)

During my internship at Embraer Commercial Aviation, one of my vital roles was to develop and improve system tool kits for material processes. My responsibilities included familiarising myself with the operations (spare parts and repair) and using problem-solving skills in my daily tasks.

One of the tasks undertaken was to automate the SAP process to send out parts with quality issues. With the proper guidance, support and teamwork, my colleague and I successfully sent out more than 30 parts within a short period of time, improving the user efficiency by more than 50%.

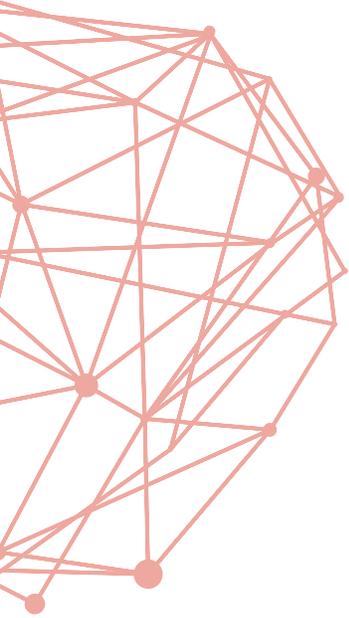
It was an interesting and fulfilling experience to learn more about inventory planning and management which added value to my internship experience.

“**Embraer Asia Pacific showed me how people from diverse cultures and backgrounds can dynamically work together and give the best possible performance.**”



- ## Aerospace
- DSO National Laboratories
 - Honeywell Aerospace
 - Nordam Singapore
 - Pratt & Whitney
 - Rolls-Royce International
 - Singapore Airlines
 - ST Aerospace Engineering

- ## Mechanical
- 3M Singapore
 - Dyson
 - ExxonMobil
 - Johnson & Johnson
 - Keppel Offshore & Marine
 - Rolls-Royce International
 - ST Engineering



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