UNIVERSITY OF
Southampton

# ACCELERATE THE FUTURE OF AEROSPACE

**AERONAUTICS AND ASTRONAUTICS**

POSTGRADUATE COURSES 2020

FOUNDING MEMBER OF THE
RUSSELL GROUP

# CHOOSE SOUTHAMPTON

**Top 100**
global university*

**Top 20**
UK university**

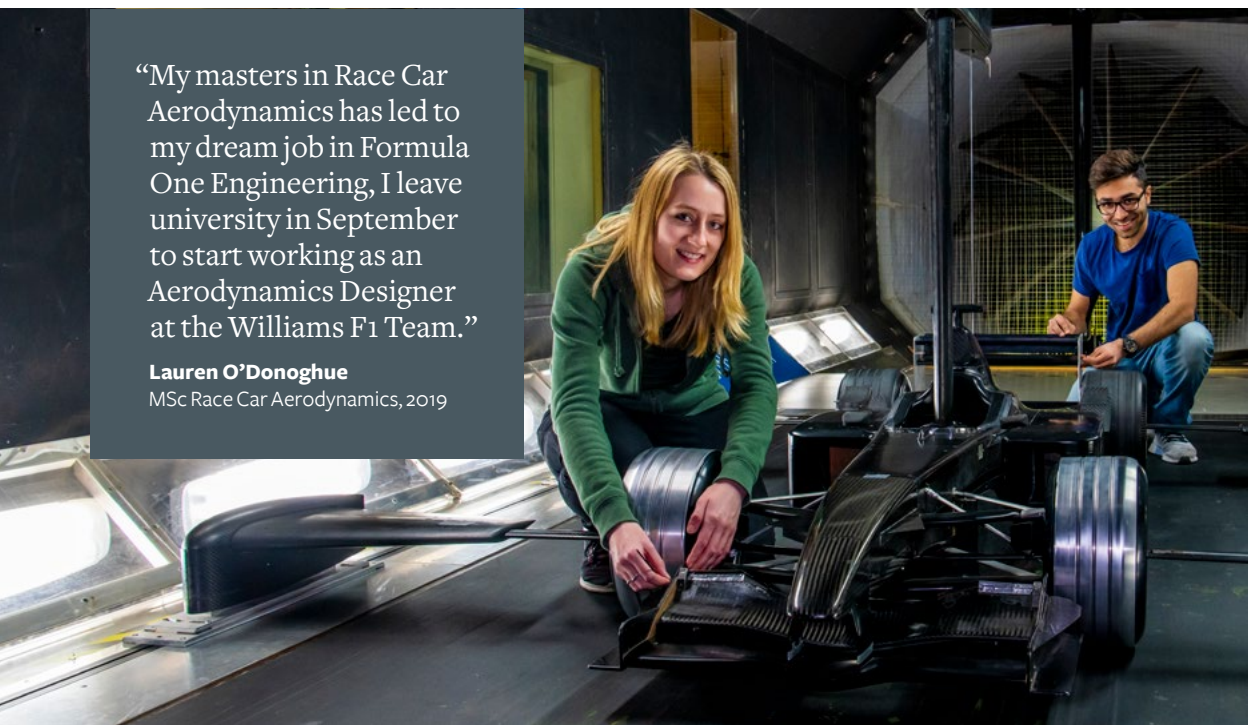
**Top 10**
in the UK for research intensity***

**1st**
for research power in General Engineering***

Our researchers designed, built and flew the world's first **3D-printed unmanned aircraft**

World-class facilities, including the **R.J. Mitchell Wind Tunnel**, which has been used by Formula 1, America's Cup yacht teams and Olympic teams

* QS World University Rankings, 2020 ** Complete University Guide, 2020 *** Latest REF, 2014



"My masters in Race Car Aerodynamics has led to my dream job in Formula One Engineering, I leave university in September to start working as an Aerodynamics Designer at the Williams F1 Team."

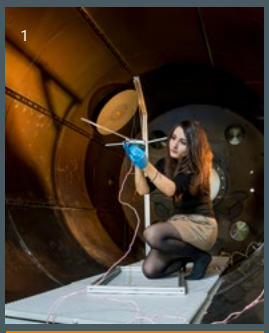
**Lauren O'Donoghue**
MSc Race Car Aerodynamics, 2019

# RESEARCH EXCELLENCE

Researchers at the University of Southampton have been working at the cutting-edge of aerodynamics and flight for over 120 years. Our engineers made aviation history with the world's first human-powered flight, completed the first fully turbulent aerofoil flow simulations, and designed built and flew the world's first 3D-printed UAV.

Our expertise looks deep below the Earth's crust, reaches into space and encompasses everything in between. Our key research areas:

- Integrated and sustainable cities
- Leading-edge healthcare and medicine
- Manufacturing and materials of the future
- Robotics and autonomous systems
- Space and satellite technologies
- Bioscience and biotechnology
- New energy technologies
- Transformative digital technologies

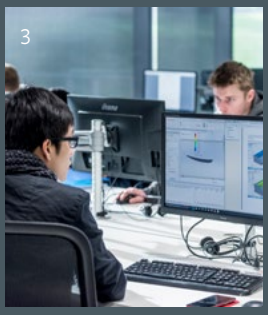

1

**91%**
of research activity is rated as internationally excellent or of world-leading quality*


2

Our supercomputer, **Idris 5**, is capable of performing over a **quadrillion calculations** per second

We developed the first low-cost **maritime surveillance UAV**, 2SEAS


3

We have been working with race car teams for over
**40 years**

Our researchers have helped **shape international guidelines** for space sustainability and for the mitigation of space debris

1. Testing in the spacecraft propulsion laboratory
2. Working in the UAV research laboratory
3. Studying at our Boldrewood Innovation Campus

*In General Engineering in the latest REF, 2014

# TAUGHT PROGRAMMES

## Key facts

Unless otherwise stated

**Entry requirements:** a UK bachelors degree with upper second-class honours or higher in engineering, mathematics, physical sciences or a related subject. See international equivalent qualifications **www.southampton.ac.uk/pg/entry**

**English language:** band B, IELTS 6.5 overall, with a minimum of 5.5. in all components. For more information, visit **www.southampton.ac.uk/pg/el**

**Assessment:** examinations, presentations, coursework, and dissertation

**Duration:** one-year full time

**Start date:** September

**Applying:** University online application form with transcripts and personal statements

**Closing date:** 31 July

**Fees and funding:** scholarships and bursaries are available for some of our programmes. Visit **www.southampton.ac.uk/pg/fees** for programme-specific details

By studying your postgraduate degree at Southampton, you will be part of a cutting-edge research environment, be exposed to current issues taking place in our world and explore the latest technologies in your field.

## MSc Aerodynamics and Computation

**Programme Lead:**
**Dr Zhiwei Hu**

Our MSc Aerodynamics and Computation focuses on numerical methods and the physics and computation modelling of turbulence, enhancing your knowledge of flow physics and ability to use state-of-the-art computational tools to improve industrial designs.

This course is ideally suited for engineering, mathematics and science graduates with a strong background in fluid dynamics or aerodynamics. It will prepare students well for careers in industrial research and development, as well as those that are perhaps thinking of pursuing postgraduate research.

You will take part in individual and group practical work as well as a critical research project, developing your expertise in aerodynamics. You will examine current trends and challenges and engage in discussion and research on critical issues within the field and develop your ability to use experimental and advanced computational methods, such as particle image velocimetry, finite volume method and high-order finite difference methods.

Past students have undertaken research projects such as the investigation of the installation effects on the noise of Dyson high-spend fans, aerodynamic load estimation from particle image velocimetry, and morphing wings aircraft modelling. Projects are often linked to our current research activities, or supported by industry or government funding bodies.

You will benefit from state-of-the-art facilities including high-performance computers and the RJ Mitchell Wind Tunnel, the largest university wind tunnel in the UK.

Recent graduates have gone on to work at organisations such as Dyson and Rolls-Royce.

**Mandatory modules:**

- Advanced Computational Methods 1
- Aerothermodynamics
- Applications of CFD
- Research Project
- Turbulence: Physics and Modelling

**Module options include:**

- Advanced Computational Methods 2
- Aeroacoustics
- Aeroelasticity
- Biological Flow
- Design Search and Optimisation
- Experimental Methods for Aerodynamics
- Flow Control
- Hypersonic and High Temperature Gas Dynamics
- Numerical Methods
- Race Car Aerodynamics
- Wing Aerodynamics

**Accredited**
by the
**Royal Aeronautical Society (RAeS)**
and the
**Institution of Mechanical Engineers (IMechE)***

* The accredited MSc will meet, in part, the exemplifying academic benchmark requirements for registration as a Chartered Engineer. Candidates must hold a BEng/BSc undergraduate first degree that is accredited for Chartered Engineer (CEng) registration to comply with full CEng registration requirements.

**Find out more:**
**www.southampton.ac.uk/pg-aero-astro**
Or to have specific questions answered:

**T:** +44 (0)23 8059 9699
**E:** enquiry@southampton.ac.uk

## MSc Race Car Aerodynamics

**Programme Lead:**
**Dr Zhiwei Hu**

Our unique MSc Race Car Aerodynamics is recognised as a world-leading course for those wanting to enter Formula One as aerodynamicists and CFD engineers. It will enhance your knowledge of the fundamentals of aerodynamics and your skills in the analysis, modelling and measurement of turbulent flows associated with high-performance race cars.

This course will suit graduates or similarly qualified individuals from engineering, scientific and mathematical backgrounds, with some experience of fluid dynamics who are aiming for advanced specialisation in aerodynamics for high-performance vehicles.

You will take part in individual and group practical work as well as a critical research project, developing your expertise in race car design and learn to evaluate and apply experimental aerodynamic concepts. You will also learn advanced computational fluid dynamics and numerical procedures to counteract problems that may occur in the design process.

Past students have undertaken research projects such as the analysis of an aerodynamic upgrade of 2017 Formula One cars, comparison of overtaking performance of Indycar Aero Kits, and the development of an aerodynamics package for a touring car. Projects are often linked to our current research activities or supported by industry.

You will benefit from state-of-the-art facilities including high-performance computers and the RJ Mitchell Wind Tunnel, the largest university wind tunnel in the UK.

Recent graduates have gone on to work in Formula One teams such as Mercedes-AMG Petronas Motorsport and Racing Point Force India.

**Mandatory modules:**

- Applications of CFD
- Experimental Methods for Aerodynamics
- Race Car Aerodynamics
- Race Car Design
- Research Project
- Turbulence: Physics and Modelling

**Module options include:**

- Advanced Computational Methods 1
- Advanced Computational Methods 2
- Aeroelasticity
- Automotive Propulsion
- Automobile Systems
- Design Search and Optimisation
- Flow Control
- Numerical Methods
- Systems Reliability
- Wing Aerodynamics

## MSc Space Systems Engineering

**Programme Lead:**
**Dr Zhiwei Hu**

Our unique MSc Space Systems Engineering has been developed by world-renowned experts in our Astronautics research group and draws on content from the professional courses we run for the European Space Agency and spacecraft industry.

The course is endorsed by the UK Space Agency, and provides an integrated approach to the design of a total space system and describes how the various component subsystems function and interface with one another, giving you advanced knowledge of space systems engineering.

This course will suit graduates or similarly qualified individuals from engineering, scientific and mathematical backgrounds, with some experience of astronautics or aerospace engineering, who are aiming for further specialisation in spacecraft engineering.

You will take part in individual and group practical work as well as a critical research project, developing your expertise in spacecraft engineering. Past students have undertaken research projects such as the design of a very low Earth orbit (VLEO) satellite constellation, the development of a microwave electron cyclotron resonance gridded ion thruster, and an ultra-small nano-Hall effect thruster for operation on CubeSats. Projects are often linked to our current research activities or supported by industry, for instance Surrey Satellite Technology.

You will benefit from state-of-the-art facilities including our spacecraft propulsion laboratory, autonomous systems test bed and shaker table.

Recent graduates have gone on to work at organisations such as Airbus, Canadian Space Agency, GMV and Rutherford Appleton Laboratory.

**Mandatory modules:**

- Advanced Astronautics
- Concurrent Engineering Design
- Research Project
- Spacecraft Orbital Mechanics and Control
- Spacecraft Propulsion
- Spacecraft Structural Design
- Space Systems Engineering
- Space Systems Instrumentation

**Module options include:**

- Applications of CFD
- Principles of Photovoltaics, Fuel Cells and Batteries
- Space Environment
- Systems Reliability
- Turbulence

## MSc Unmanned Aircraft Systems Design

**Programme Lead:**
**Dr Zhiwei Hu**

Our MSc Unmanned Aircraft Systems Design has been created to provide graduate engineers with the skills and knowledge needed to design these sophisticated systems. The emphasis of the course is on the design of the vehicle, including aerospace control systems and avionics. It is supported by several major UK companies, including Thales, BAE Systems, Rolls-Royce, QinetiQ, and Cobham.

This course is ideally suited to graduates or similarly qualified individuals from engineering, scientific and mathematical backgrounds looking to specialise in unmanned systems or to enter this fast-paced industry.

You will have the opportunity to design and build a sophisticated unmanned system, take part in individual work, and undertake a critical research project. Past students have undertaken research projects such as the development of a UAV hybrid power system, a vehicle-launched vertical take-off and landing (VTOL) unmanned aerial vehicle for search and rescue operations, and investigations into the aerodynamic performance of bio-inspired morphing UAV wings.

Projects are often linked to our current research activities or supported by industry, for instance Airbus, BAE Systems and Thales.

You will benefit from state-of-the-art facilities to put your design through mission validation including a sophisticated autopilot system and dedicated flying site, state-of-the-art wind tunnels and rapid prototyping laboratories. You will also have the opportunity to study for a pilot's licence.

Recent graduates have gone on to work at organisations such as the Royal Navy and the ULTRA large UAV project, as well as going into postgraduate research.

**Mandatory modules:**

- Aerospace Control Design
- Avionics
- Design Search and Optimisation
- Group Design Project
- Research Project
- Systems Reliability

**Module options include:**

- Advanced Control Design
- Advanced Finite Element Analysis
- Advanced Sensors and Condition Monitoring
- Aeroelasticity
- Aircraft Propulsion
- Aircraft Structural Design
- Aircraft Structures
- Applications of CFD
- Automotive Propulsion
- Composites Engineering Design and Mechanics
- Control and Instrumentation
- Finite Element Analysis in Solid Mechanics
- Powered Lift
- Wing Aerodynamics

"My project work has led me to become a more innovative engineer, I've pushed myself to figure out the reason why things do or don't work."

**Louis Le Querec**
MSc Unmanned Aircraft Systems Design

# GLOBAL IMPACT

We have a world-leading reputation for excellence in teaching and research in aerospace engineering. Our state-of-the-art engineering facilities are integral to our curriculum and support a diverse range of physical testing and analysis, computational modelling and simulation, imaging and manufacturing.

We have excellent relationships with industry both in the UK and internationally, providing support through joint projects, consultancy, commercialisation of research, and knowledge transfer. Within the field of aerospace engineering our strategic relationships include Airbus, Rolls-Royce and Microsoft.

## WE ARE:

Helping to develop **cheaper, more fuel-efficient** engines, through our computational modelling research with Rolls-Royce

Leading unmanned aircraft systems development, including making the **world's first** 'smart' paper aeroplane

Leading the way in **aircraft noise reduction**

**Advising policymakers** on space policy to manage space debris and satellites

Part of the Science and Engineering Consortium, the **most powerful** cluster of research-intensive universities in the UK

## HOW DO I APPLY?

Before applying for postgraduate taught study, you should:

- check you meet the entry requirements
- if applicable, ensure that you meet any special requirements for international students
- identify how you will fund your postgraduate study
- obtain supporting documentation to include as part of your application

## APPLY NOW

Apply to Southampton for postgraduate taught degrees

**Find out more:**
www.southampton.ac.uk/pg-aero-astro

**Find out more:**
www.southampton.ac.uk/pg-aero-astro

UK enquiries:
enquiry@southampton.ac.uk
+44 (0)23 8059 9699

International and EU enquiries:
international@southampton.ac.uk
+44 (0)23 8059 9699

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