

# BACHELOR OF ENGINEERING (HONS) MECHANICAL ENGINEERING

Awarded by Northumbria University (UK)

## Programme Objectives

The programme aims:

- To produce graduates in Mechanical Engineering with the necessary skills and attributes to take roles within industry as Professional Engineers, and provide the educational basis to facilitate progression to Chartered Status
- To produce graduates who can apply fundamental scientific principles and mathematical and computational techniques to realise creative and innovative solutions to engineering problems
- To equip students with an awareness of engineering in the wider social, ethical, sustainable and economic context
- To provide wide opportunities for access, personnel and professional development, consistent with Professional Body requirements

It is anticipated that students graduating from this programme will be able to take up a range of engineering roles and make immediate and valuable contributions to engineering businesses.

## Programme Structure

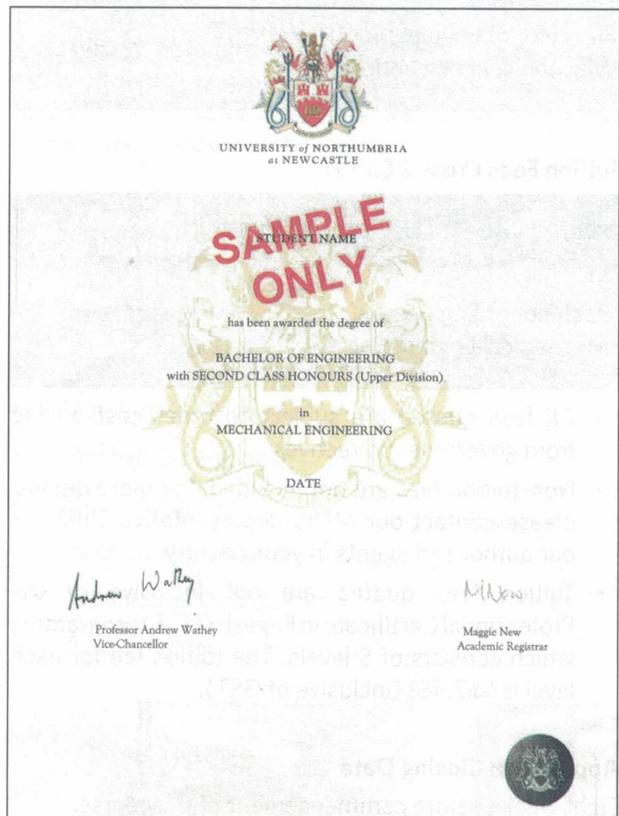
### Course Duration

| Year 1 Entry |           |
|--------------|-----------|
| Full-time    | 28 months |
| Year 2 Entry |           |
| Full-time    | 16 months |

## Assessment Methods

The modules will be assessed either by coursework, examinations or a combination of both appropriate to the module objectives.

## Sample Certificate



## Programme Modules

| YEAR 1   | YEAR 2  | YEAR 3                              |
|--|---|-------------------------------------|
| <i>Introductory Mechanics</i>                          | <i>Applied Mechanics</i>                      | <b>CORE MODULES</b>                 |
| Energy and the Environment                             | Energy Conversion Systems                     | Advanced Mechanics                  |
| Design   | Computer Modelling and Design                 | Energy Management and Efficiency    |
| Materials and Manufacture                              | Manufacturing Technology                      | Investigative Project               |
| Engineering Skills in Experimentation and Presentation | Engineering Economics and Professional Skills | Design for "X"                      |
| Engineering Mathematics                                | Further Engineering Mathematics               | <b>OPTION (CHOOSE EITHER 1)</b>     |
|  |   | Digital Product Design and Analysis |
|  |   | Renewable Energy Technology         |

## Fees

### Application Fee

Applicants are required to pay a non-refundable application fee of S\$321.00 (inclusive of GST).

### Tuition Fees (Year 1 Entry)

|  | Amount<br>(inclusive of GST) |
|--|------------------------------|
| Bachelor of Engineering (Hons)<br>Mechanical Engineering | S\$41,730.00                 |

### Tuition Fees (Year 2 Entry)

|  | Amount<br>(inclusive of GST) |
|--|------------------------------|
| Bachelor of Engineering (Hons)<br>Mechanical Engineering | S\$28,890.00                 |

- All fees quoted are subject to other cost arising from government directives.
- Non-tuition fees are not included. For more details, please contact our MDIS Representative Office or our authorised agents in your country.
- Tuition fees quoted are not inclusive of the Professional Certificate in English (PCIE) programme which consists of 5 levels. The tuition fee for each level is S\$2,461 (inclusive of GST).

### Application Closing Date

Eight weeks before commencement of the course.

## Entry Requirements

Applicants must be of age 18 and above, and possess one of the following:

- International Baccalaureate Diploma with minimum 27 points including Mathematics and an analytical Science subject at higher level

### Malaysia

- Malaysian Higher School Certificate (STPM) with Mathematics and Science subjects with at least B, B, C
- Diploma in relevant Engineering discipline accredited by Malaysian Qualifications Agency (MQA)

### India

- Higher Secondary School Certificates (HSSC Year 12), Central Board of Secondary Education (CBSE) or Indian Certificate of Secondary Education (ICSE) overall score at least 65%
- Diploma in relevant Engineering discipline

### Pakistan

- Higher Secondary School Certificates (HSSC Year 12) with at least 75% or more in Senior High School Certificate
- Diploma in relevant Engineering discipline with 54.5% or 2.5CB from Bachelor's degree if studied for between 2 and 3 years

### Vietnam

- Tot Nghiep Pho Thong Trung Hoc (Year 12) minimum 8.0

### Korea

- Junior College Diploma/Associate Degree with C+/2.5/75\*79%

### Russia

- Certificate of Secondary Education and an acceptable grade from a recognised Foundation programme i.e. Average of 4 in Certificate of Secondary Education and all Bs in Foundation Programme

Other recognised equivalent may be assessed by the University on a case-by-case basis.

## Advanced Standing

Advanced standing for Year 2 will be considered for:

### Malaysia

- Diploma in relevant Engineering discipline accredited by MQA with minimum CGPA 3.0

### India

- Diploma in relevant Engineering discipline - Students who have completed Std. 12 and who have also obtained a three year Diploma in Mechanical Engineering

### Pakistan

- Diploma in relevant Engineering discipline (54.5% or 2.5CB from Bachelor's degree if period of study is between 3 and 4 years)

Other recognised equivalent may be assessed by the University on a case-by-case basis.

### English Language Requirement

Applicants are required to possess at least one of the following:

- Minimum C6 pass in English Language (EL1) and Elementary Mathematics at GCE 'O' Level or equivalent
- A British Council International English Language Testing System (IELTS) score of 5.5 (or above) with a minimum score in each component of Reading, Writing, Listening and Speaking of 5.5
- Pearson Academic score of 51 (or above) with a minimum score in each component of Reading, Writing, Listening and Speaking of 51
- Pass and complete MDIS Professional Certificate in English
- Recognised equivalent

## Career Opportunities

Graduates of this course have enjoyed a wide range of employment opportunities with major national and international companies including ICI, Rolls Royce, British Aerospace, BAE Systems and Shell (UK). Engineers are in high demand worldwide, with UK Government emphasising the importance of skilled, qualified engineers to the future of business and industry.

The skills provided by a mechanical engineering degree set you up for roles in all areas of engineering, but the numerical content of the course also allows entry into finance and management careers.

- Aerospace engineer
- Automotive engineer
- Contracting civil engineer
- Control and instrumentation engineer
- Maintenance engineer
- Mechanical engineer
- Mining engineer
- Production manager
- Technical sales engineer
- Water engineer



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# Module Descriptions

## Year 1

### Introductory Mechanics

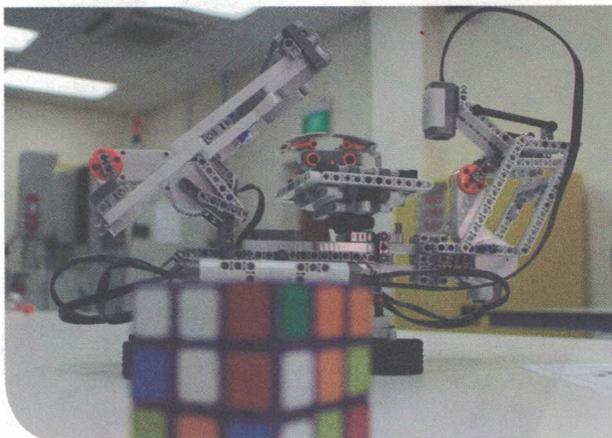
This module introduces the application of Newton's laws of mechanics in static and dynamic systems. Alternative methods of analysing dynamic systems such as work/energy and impulse are also introduced together with a basic introduction to vibrations. The basic principles of stress and strain in one dimension are introduced. The theory of direct shear, bending and torsional stress are developed and used in design calculations along with experimental techniques for measuring these values.

### Energy and the Environment

This module will involve a study of the earth's energy resources, their conversion to useful energy and the associated environmental impacts. The fundamentals of heat and fluid dynamics applied to industrial systems will be covered along with the core electrical power components and systems required for this.

### Design

This module will introduce the theoretical aspects of concepts and methods of the design process and the use of engineering materials to create and develop economically viable products to satisfy customer and user needs. It will include both "paper" and practical "design-make-test" exercises which require an understanding (that will be developed in the module) of the different properties of engineering materials. Design constraints including environmental and sustainability limitations, and health and safety issues will be considered. Appropriate computer software will be used to aid the design process, including the production of engineering drawings (2D draughting and 3D modelling) and manufacture of prototypes.



### Materials and Manufacture

The module aims to develop knowledge and skills in engineering materials and manufacturing. Properties of engineering materials will be considered. A range of traditional and modern engineering manufacturing processes will be covered. Both subtractive and additive processes will be included along with general shaping considerations. For a wide range of engineering materials, general material properties will be studied with the mechanical properties such as strength, toughness and stiffness being dealt in detail. The influence of properties on the selection of materials will be considered. Explanations of the underlying materials science will be included. Students will be made aware of health and safety issues related to materials and manufacturing.

### Engineering Skills in Experimentation and Presentation

The module aims to develop engineering skills in experimentation and presentation that the student will be able to apply throughout their studies and beyond. Students will be introduced to the techniques required to conduct experimental work, gathering and analysing data (for example, from laboratories and reference material where appropriate, including comparing results with expected results from reference material), and to communicate the findings through a formal written technical report and a formal presentation.

### Engineering Mathematics

The module provides a first level course in engineering mathematics. Fundamentals of algebra, trigonometry and calculus are reviewed. The student's knowledge of calculus is extended and complex numbers, matrices, vectors and differential equations are studied. The module is taught via a combination of lectures and problem solving sessions.

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## Year 2

### Applied Mechanics

This module introduces the principles of two-dimensional stress and strain analysis, and their application in torsion, bending and pressure vessels. Standard methods for analysing structural elements, such as beams, struts and frames are introduced. Consideration is given to the kinematics of particles, rigid bodies and mechanisms. Frames of reference and their various methods of solution are considered in detail. This module also contains material on vibration analysis and engineering structures, the analysis of free and damped vibrating systems and the application of transmissibility and absorbers to engineering systems.

### Energy Conversion Systems

The module introduces the principles of thermo-fluid mechanics and their application to energy conversion systems. The importance of the fundamental principles of thermodynamics for heat and work transfer in a variety of engineering devices will be explored. The theoretical limitations posed by the Second law of thermodynamics will be explored. A set of laboratory experiments along with seminar activities will be used to highlight the need to appreciate the differences between theoretical calculations and the practical results obtained from real systems.

### Computer Modelling and Design

This module will provide the student with the ability to use Computer Aided Engineering (CAE) tools within the analysis and engineering design process. Upon completion of the module, student will be able to apply CAE and Computer Aided Design (CAD) software tools, critically evaluate the practical limitations of CAE software and analytical methods, and evaluate the performance of a designed component by fabricating and testing a prototype.

### Manufacturing Technology

The module will cover manufacturing technology, including the major materials used for selection of manufacturing processes, principles of instrumentation electronics and industrial automation techniques that would be used to control them. It will further develop the student's appreciation of the relationship between design, engineering materials and manufacturing processes with particular emphasis on casting, welding, joining, cold forming, machining and extrusion. The module also introduces aspects of industrial automation, especially PLC and pneumatic control. The concept of instrumentation and the electronics associated with it are introduced along with the use of lab view to capture data.

### Engineering Economics and Professional Skills

The aim of this module is to enable students to develop the necessary professional skill sets for the advancement of the engineering professional. This will include engineering economics, critical thinking and communication skills. Module content will include an introduction to the financial decision making methods used to evaluate manufacturing options from an economic viewpoint, and the techniques used to evaluate and improve personal, team and organisational efficiency levels. This will be further enhanced with content on how such factors may be influenced by quality control aspects, together with their importance and links in terms of engineering project management.

Opportunities are provided for students to develop, and reflect on the role of, effective interpersonal communication and professional development skills within a professional context. Students are expected to become aware of the skills required by their profession including personal development planning, knowledge of relevant legislation and codes of conduct, and the need to communicate balanced arguments relating to professional and ethical issues.

### Further Engineering Mathematics

The module is designed to extend the student's expertise in engineering mathematics. Specifically, Laplace Transforms, statistics, numerical methods and matrix methods are studied.

## Year 3

### Core Modules

#### Advanced Mechanics

This module will consider advanced methods of vibration and stress analysis. Matrix methods, Holtzer's method, and Dunkerley's and Rayleigh's principles will be used for vibration analysis. This module reviews and shows the application of the techniques of vibration monitoring that are available to the modern engineer. The applications are illustrated with the use of case studies. This module also introduces some advanced topics in stress and deformation analysis for: statically indeterminate structures, components made of non-homogenous materials and components subject to impact loading.

#### Energy Management and Efficiency

The module develops the student's knowledge of energy management and efficiency. This will include energy economics and management applied to industrial energy and propulsion system applications. Advanced energy systems topics will be analysed in depth and compared to real industrial applications. Advanced gas power cycles, air conditioning and cooling towers, refrigeration and heat pump systems, roto-dynamic and hydraulic systems will be considered in detail. Understanding and critical analysis of ethical issues and principles in relation to energy management will also be covered.

#### Investigative Project

The individual project provides an opportunity for the student to undertake a substantive piece of self-directed work which will integrate many aspects of mechanical engineering studied elsewhere in the programme. This technical investigation will be characterised by the:

- Selection of a subject area, establishing aims and objectives, and developing a problem statement
- Selection of appropriate theory to support the experimental or explorative investigations, including a critical evaluation of published literature
- Development of appropriate investigation methods and techniques with an evaluation of their limitations and accuracy
- Execution of a structured experimental or explorative programme, including refinement and validation as appropriate
- Analysis of experimental and/or modelling data, presentation of significant results and the drawing of conclusions
- Writing of a technical report and presenting results to inform a professional audience

#### Design for "X"

This module aims to make use of the knowledge and analytical skills developed during previous study to specify, design and manufacture products. This module will introduce and develop the advanced techniques of Design for "X" where "X" refers to materials, manufacture, assembly, environment, sustainability, economy, robust design, intellectual property rights and design of experiments.

This module in addition investigates corrosion and degradation of engineering materials under mechanical and environmental stress. Consideration is given to design with ductile / brittle materials and failure by the mechanisms of creep and fatigue.

#### Option (Choose either 1)

##### Renewable Energy Technology

This module has been designed to promote the student's employability in the growing renewable energy industry. This module introduces theories and principles relating to a variety of renewable energy technologies. On completion of this module, students should have essential knowledge in theories behind various energy conversion technologies and should be able to perform essential calculations in estimating the amount of energy produced by various renewable energy devices.

##### Digital Product Design and Analysis

The module is focused on an industrially relevant product development project which has individual and group based elements. This is intended to allow students to experience and demonstrate their depth of understanding of the design, analysis and manufacturing processes and to reflect on modern product development practices. This module aims to make use of the knowledge and analytical skills developed throughout the student's studies to design and manufacture engineered products using digital 3D design, manufacturing and analysis systems.