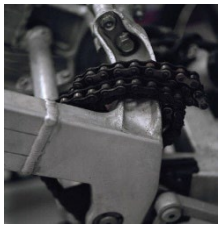
Mechanical Engineering Modules for Visiting Students 2026/27



The subject of mechanical engineering explores the processes by which mechanical products and systems are designed and manufactured. Such students at Kingston are able to gain theoretical and practical knowledge in all aspects of the subject including engineering design, thermodynamics, fluid mechanics, applied mechanics and electronics.

The Department of Mechanical Engineering has an applied approach to teaching, which is facilitated by the provision of dedicated laboratories. These include state-of-the-art facilities for rapid prototyping and manufacturing, a fully equipped materials laboratory, and a modern electronics and robotics lab. Other technology and industry-standard equipment includes a 3D design studio and workshop, a mechanical engineering workshop, 3D printers, CNC 4 axis machine and rolling roads.

Level 4 modules are introductory and provide a solid knowledge of the general technical and non-technical subjects that underpin mechanical engineering practices.

Level 5 introduces more focused studies, covering specialist subjects such as applied mechanics, fluid mechanics, thermodynamics, electronics, control and computing. Students also have the opportunity to extend their mathematics and project-management abilities.

Level 6 modules are advanced and are comprised of core engineering topics and advanced mechanical engineering modules, with a strong focus on independent and group project work.

Updated September 2026/PJW

Entry requirements: GPA of 2.75 or above (out of 4.0) or equivalent

Pre-requisites:

- **Level 4:** prior introductory university-level study of physics/mathematics is very useful.
- **Level 5:** prior study of mechanical engineering topics is required (at level 4 or equivalent).
- **Level 6:** substantial prior study of mechanical engineering is required.
- **For levels 5 and 6,** any specific pre-requisites for individual modules will be detailed in each module description.

Taught at: Roehampton Vale campus

Mechanical Engineering Modules for Visiting Students 2026/27

Key:

KEY TO MODULE DESCRIPTORS
SUITABILITY OF MODULE FOR STUDENTS VISITING KU ON STUDY OPTION ____
1: Indicates module is suitable for students visiting KU on Study Option 1 (Whole Year)
2: Indicates module is suitable for students visiting KU on Study Option 2 (Autumn)
3: Indicates module is suitable for students visiting KU on Study Option 3 (Spring)

Notes:

1. *All modules are at undergraduate level only.*

2. *Students enrolled on Study Option 1 are required to study the entire module.*

3. *Whilst the University makes every effort to ensure that this information is correct at the time of updating (August 2026), it cannot accept responsibility for omissions or subsequent changes. Module availability and content may be subject to change, as part of the University's policy of continuousimprovement and development.*

4. *Details of assessment for students enrolled on either Study Option 2 or 3 where provided are indicative only and may also be subject to change as part of the above policy.*

MODULE CODE	LEVEL	MODULE TITLE	SUITABILITY KEY
EG4009	4	Engineering Mathematics and Programming	1, 2, 3
ME4015	4	Engineering Mechanics and Materials	1
ME4024	4	Engineering Science	1, 3
ME5025	5	Applied AI and Mechatronics	1
ME5028	5	Thermofluids and Solid Mechanics	1, 2, 3
ME6018	6	Fluid Dynamics and Thermal Systems	1, 3
ME6019	6	Machine Design with Finite Element Method	1, 2

LEVEL 4 – INTRODUCTORY

Module Code: EG4009

Module Title: Mathematics and Programming

Credits:

- Full Year: 8 (US) 15 (ECTS)
- Single Semester: 4 (US) 7.5 (ECTS)

Level: 4

Prerequisites: prior study of university-level maths and programming concepts is useful

Suitability:

- Study Abroad/International Exchange students for Study Options 1 or 2 or 3
- Not open to Erasmus students (as Level 4, unless home university agrees)

Content:

This module provides students with a solid foundation in the core mathematical and computational skills required for modern engineering practice. Students are introduced to key areas of engineering mathematics and shown how these are applied to the analysis and design of engineering systems. Alongside the mathematical content, students develop scripting and computational problem-solving skills using industry-relevant software tools such as MATLAB, Excel, and Python.

Students learn the fundamentals of programming, including data handling, task automation, and algorithmic thinking, enabling them to implement mathematical methods effectively in software. Through practical examples and exercises, they gain experience in translating mathematical concepts into computational solutions. This computational skillset provides them with a strong foundation for future study in areas such as machine learning, artificial intelligence, and advanced engineering analysis.

➢ **Topics**

- Algebra, trigonometric, and complex functions
- Matrices, vectors and geometry
- Differentiation and integration, including maxima, minima, and partial differentiation
- First-order differential equations
- Statistics and probability, including correlation and regression
- Numerical methods such as Newton's method and numerical integration
- Alongside the mathematics, you will learn computational problem-solving using programming. Topics introduced will include:
- Using an integrated development environment (IDE)

- Fundamentals of scripting and object-oriented programming
- Variables, data types, input/output, and formatting
- Control structures (loops and decision statements)
- Functions, modules and basic data structures
- Arrays, slicing and file handling
- Plotting data and generating numerical and graphical results
- Writing, testing and debugging scripts for engineering applications

Teaching: weekly two-hour lecture and a two-hour computing session

Assessment:

- Study Option **1:**
  - Portfolio of 8 in-class tests (1 hour each)
  - Online programming exercises (300 words)
- Study Options **2/3**:
  - Portfolio of in-class tests (1 hour each)
  - Online programming exercises (300 words)

Note: methods of assessment listed are indicative only and may be subject to change

Last updated: 08/09/26 PJW

Return to top

Module Code: ME4015

Module Title: Engineering Mechanics and Materials

Credits:

- Full Year: 8 (US) 15 (ECTS)

Level: 4

Prerequisites: prior study of university-level physics concepts is useful

Suitability:

- Study Abroad/International Exchange students for Study Option 1 only
- Not open to Erasmus students (as Level 4, unless home university agrees)

Content:

The module introduces students to the fundamentals of structural analysis (statics and dynamics) and the mechanical behaviour of a broad range of engineering materials. The mechanics part provides an understanding of the behaviour of particles and rigid bodies whilst stationary and in motion. Bodies such as trusses in equilibrium are studied and the external and internal parameters including force, moment, stress, or strain are defined and calculated. The analysis of structural components will be developed with theoretical and numerical skills that are necessary in the design of real structures. This section also introduces the dynamics of particles and rigid bodies with their engineering applications. Material test methods will be used to determine the deformations and failures of the various engineering materials. A selection of materials for engineering applications, such as metals, alloys, polymers, and composites, will be studied including their carbon footprint and their impact on the environment.

- **Autumn: Materials and Statics:**

❖ ***Materials***

- Classification of materials, mechanical properties, stress, strain
- Elasticity, plasticity, brittleness, and ductility of materials, mechanical testing
- Crystal structure, solids, defects, and mechanical treatments
- Deformation mechanism and fracture mechanics
- Fatigue failure
- Polymers
- Composite materials
- Phase diagrams, steel, heat treatments

❖ ***Statics***

- Statics, Vectors and equilibrium of a particle
- Maths for statics
- Moment, equilibrium of rigid body, supports
- Trusses
- Properties of areas
- Beams, sheer force, bending moment
- Engineer's theory of bending

Teaching: weekly four-hour lectures and three-hour practical sessions (Autumn semester)

Assessment:

- Lab report (50%)
- 3-hour MCQ test (50%)

Mechanical Engineering Modules for Visiting Students 2026/27

Note: methods of assessment listed are indicative only and may be subject to change

Last updated: 08/09/26 PJW

Top

Module Code: ME4024

Module Title: Engineering Science

Credits:

- Full Year: 8 (US) 15 (ECTS)
- Single Semester: 4 (US) 7.5 (ECTS)

Level: 4

Prerequisites: prior study of university-level physics is useful

Suitability:

- Study Abroad/International Exchange students for Study Options 1 or 3
- Not open to Erasmus students (as Level 4, unless home university agrees)

Content:

This module introduces fundamental engineering principles across fluid mechanics, thermodynamics, and electrical and electronic engineering, providing a balanced foundation in mechanical and electrical engineering concepts and their practical applications.

The Fluid Mechanics and Thermodynamics part of the module explores fluid properties, pressure and flow, conservation principles, heat, work and energy, and the fundamental laws of thermodynamics. These concepts are applied to practical engineering systems such as fluid-flow systems, internal combustion engines, pumps, and heating and air-conditioning systems, developing your ability to analyse and solve fundamental mechanical engineering problems.

The Electrical and Electronic Engineering part introduces key electrical quantities, including charge, voltage, current, resistance, power and energy, followed by the analysis of AC and DC circuits. You will also explore fundamental electronic components and devices, including diodes, transistors and operational amplifiers, before progressing to Boolean logic and basic combinational and sequential digital systems, with applications to sensing, actuation, control and other engineering systems.

- **Autumn Semester: Electrical and Electronic Fundamentals, Electronic Circuits & Logic**
- **Spring Semester: Thermodynamics and Fluid Dynamics**

Teaching:
- weekly two-hour lecture (Autumn)
- weekly two-hour and three-hour practical sessions (Spring)

Assessment:

- Study Option **1:**
- In-class test (50%)
- Practical lab reports (50%)

- Study Option **3:**

- Part of study option 1 assessment

Note: methods of assessment listed are indicative only and may be subject to change

Last updated: 08/09/26 PJW

Return to top

LEVEL 5 – INTERMEDIATE

Module Code: ME5025

Module Title: Applied AI and Mechatronics

Credits:
- 8 (US) 15 (ECTS)

Level: 5

Prerequisites: prior study of introductory university-level mechanical engineering topics

Suitability:
- Study Option 1 only

Technological advancements across engineering increasingly rely on intelligent and automated systems. In this module, students build on their introductory (Level 4) knowledge to develop a strong foundation in microcontrollers, control engineering, automation, and applied artificial intelligence for mechanical and

automotive applications. They deepen their understanding of microcontroller platforms, sensors, actuators, and system integration, while learning to model, analyse, and design dynamic control systems.

Core topics include system dynamics, stability, feedback behaviour, signal conditioning, embedded programming, and advanced control approaches. Students explore how AI-enabled decision-making and control enhance mechatronic and autonomous systems used in robotics, the automotive industry, and industrial automation.

Students use MATLAB and microcontroller programming environments to connect theory with practice through simulation and hands-on experimentation.

Teaching: weekly two-hour lectures and two-hour computing sessions

Assessment:

- Computer exercises (2,000 words) (35%)
- In-class 1-hour test (30%)
- In-class 1-hour test (35%)

Note: methods of assessment listed are indicative only and may be subject to change

Last updated: 08/09/26 PJW

Return to top

Module Code: ME5028

Module Title: Thermofluids and Solid Mechanics

Credits:

- Full Year: 8 (US) 15 (ECTS)
- Single Semester: 4 (US) 7.5 (ECTS)

Level: 5

Prerequisites: prior study of introductory university-level mechanical engineering topics such as thermodynamics and mechanics

Suitability:

- Study Options 1 or 2 or 3

Content:

This module builds on foundational knowledge from introductory (Level 4) modules, and develops the

understanding of Thermofluids and solid mechanics principles and their engineering applications.

- **Autumn Semester: Solid Mechanics**

In this section, students explore the principles governing the behaviour of deformable solids made from different materials under static and dynamic loading. Topics include mechanical properties of materials, types of loading, plane-stress and plane-strain conditions, beam design, torsion of shafts, and buckling.

Students develop the ability to design solid components and structures by selecting appropriate materials and geometry, and to apply analytical methods to evaluate stresses, strains, deformation, and dynamic response under varying load conditions.

- **Spring Semester: Thermofluids**

In this section of the module, students study thermodynamics, heat transfer, combustion, and fluid mechanics, exploring thermodynamic cycles and their application to steam power plants, gas turbines, and internal combustion engines. Students examine heat transfer by conduction and convection, as well as combustion processes and boundary-layer behaviour, supported by engineering examples and problem-solving activities that develop a student's ability to analyse thermofluid systems.

Teaching:

- weekly two-hour lectures and two-hour tutorials. Plus one two-hour practical in the spring semester

Assessment:

- Study Option **1:**

- Solid mechanics coursework – 2,500-word report (50%)
- Thermofluids in-class test (one hour duration) (50%)

- Study Option **2:**

- Solid mechanics coursework – 2,500-word report (100%)

- Study Option **3:**

- Thermofluids in-class test (one hour duration) (100%)

Note: methods of assessment listed are indicative only and may be subject to change

Last updated: 08/09/26 PJW

Return to top

LEVEL 6 – ADVANCED

Module Code: ME6018

Module Title: Fluid Dynamics and Thermal Systems

Credits:

- Single Semester: 4 (US) 7.5 (ECTS)

Level: 6

Prerequisites: intermediate-level thermodynamics/thermofluids such as ME5028 or similar

Suitability:

- This module runs entirely in the **Spring semester**
- Study Options **1** or **3**

This core module is designed to extend the students' knowledge of the analytical and numerical techniques in thermofluids. The module builds upon knowledge gained at intermediate level (level 5) to extend further students' knowledge and skills in fluid and thermal analysis. Computer simulations will be used to solve complex engineering problems with Computational Fluid Dynamics (CFD) for fluid flow and heat transfer systems. Thermofluid mechanics covers conversion and transfer of energy by turbomachines (pumps, and turbines) and heat exchangers.

➢ **Topics:**

- Compressible Flows – Basic Equations
- Mechanisms of heat transfer and heat diffusive equation.
- Compressible Flows – Isentropic relations, Nozzles operating characteristics
- Conduction heat transfer (analytical and numerical methods)
- Compressible Flows – Shock waves in nozzles
- Conduction heat transfer (extended surfaces)
- Rotodynamic Machines–Axial, radial systems, Euler equations
- Forced convection
- Rotodynamic Machines- Performances - Fluid Transient introduction
- Free convection design and Heat exchangers

Teaching:

- weekly two-hour lectures and (for six weeks, a two-hour computing session)

Assessment:

- Team-based assignment on (CFD) but each student will need to prepare and submit an individual report (3000 words) (100%)

Note: methods of assessment listed are indicative only and may be subject to change

Last updated: 08/09/26 PJW

Return to top

Module Code: ME6019

Module Title: Machine Design with Finite Element Method

Credits:

- Year: 8 (US) 15 ECTS
- Single Semester: 4 (US) 7.5 (ECTS)

Level: 6

Prerequisites: substantial prior intermediate-level study of mechanical engineering

Suitability:

- Study Options **1** or **2**

Content:

This module offers a comprehensive study of the modelling, design and integration of various machine elements including bearings, springs, gears, cams, and mechanisms. The analysis and modelling of these elements are grounded in the principles of physics, mathematics, and mechanical engineering such as solid mechanics, fluid mechanics, manufacturing, and computer simulation using Finite Element Analysis (FEA).

Students will gain experience through a design project where they design, model and characterise a mechanical system relevant to real-world applications. Problem sets directly related to each topic will reinforce the various principles taught in the lectures. Students will also gain the knowledge and skills necessary to assess the structural integrity of mechanical systems.

Practical applications of these concepts will be explored using industry-standard FEA software packages.

➢ **Topics:**

Machine and rotor dynamics: Spring supported machines, critical speed/rpm, static and dynamic balancing.
Practical skills in application of finite element software for modelling of complex structures,linear and nonlinear static analysis, transient structural analysis, linear and nonlinear buckling analysis, and structural topology optimisation.
Ability to critically evaluate and validate the FEA results.
Mechanisms and transmissions: Mechanics of the screw, and gears.
Couplings and brakes: Disc brake (evenly distributed pressure and wear), drum brake (internal and external), fixed and releasable couplings.
Bearings: roller bearings, bearing design, lifetime assessment.
Springs: torsion, coil, leaf, ring, and rubber springs.
Press and shrink-fit connections: deformation of thick-walled tubes, tolerances, and fits.
Bolts: threads, load carrying capacity, pretension, tightening/torque moment, bolt diagram.
Welded joints: static and fatigue analyses.
Critical thinking and problem solving applied to machine design.

Teaching:

- weekly two-hour lectures and two-hour tutorials (Autumn); two-hour computing sessions (Spring)

Assessment:

➢ Study Option **1:**

- In-class test (40%)
- 4,000-word report (60%)

➢ Study Option **2:**

- In-class test

Note: methods of assessment listed are indicative only and may be subject to change

Last updated: 08/09/26 PJW

Return to top