Recommendations for Admission to the « diplôme d'ingénieur »
Mechanical Engineering and Materials Science Department
International double-degree partners

The engineering programme at École des Ponts ParisTech prepares each student to become a real player in sustainable development and planning in all its dimensions. Engineers graduating from École des Ponts ParisTech are recognised by companies for their strong scientific skills combined with a capacity for practical implementation of knowledge and projects.

Engineering education at École des Ponts ParisTech leads to the development of skills in four dimensions:
- Advanced scientific and technical education: understanding and implementing conceptual, mathematical or numerical modelling approaches while knowing how to critically evaluate the results of a model is one of the foundations of the engineering profession that the School's training enables students to master.
- Project-based and on-the-job training: from the very first year, numerous collective or individual projects are developed, increasingly close to real engineering projects. For students entering the first year, four internships in laboratories and companies will punctuate the curriculum.
- Managerial, human and social skills: integrated from the first year, the human and social sciences give students an understanding of the world and the ability to take into account the problems of society. A solid knowledge of the business world is developed through courses, internships and projects.
- The ability to work in a team and to work internationally: 20% of teaching time is devoted to languages. International stays and contact with many foreign students enable engineering students to learn to work in a multicultural context.

In the context of admissions of international students from partner institutions, it should be specified that :
- The engineering degree from Ecole des Ponts ParisTech is a general engineering degree with prerequisites common to all teaching departments in the School's core disciplines: **Mathematics (Optimisation, Probability, Analysis and Scientific Computing), Continuous and Solid Mechanics, Quantum Physics and Statistics, Programming, Human and Social Sciences.**
- The vast majority of courses in engineering training are in French. A **B1 level in French** is therefore required to be proven by a certificate (TEF, TCF, DELF, DALF).
- A TOEIC score of at least 785 points (or an equivalent international test, such as TOEFL, IELTS or Cambridge Proficiency, CAE or FCE) is required in order to obtain an engineering degree from Ecole des Ponts ParisTech at the end of the course. For this reason, a **B1 level in English** is required for admission, to be proven by a certificate (IELTS, TOEFL, TOEIC, CAMBRIDGE).

In addition, each department of engineering education has specific prerequisites:

Mechanical Engineering and Materials Science Department

Scientific analysis and calculation

Fundamental numerical methods for the engineer: finite differences for time integration of evolutionary equations, finite elements for solving variational problems.
Linear algebra, matrix calculus, tensor calculus.
Laplace transform, Fourier transform.

Partial differential equations and finite elements

Automatic linear

Servoing – Control.

Solid Mechanics

- Kinematics and dynamics of non-deformable solids
- Geometric Transformation: Eulerian and Lagrangian Descriptions

- Internal stresses for 3D continuous medium: Cauchy stress tensor, Green-Lagrange strain tensor, linearization
- Thermodynamic approach to linear thermoelastic behaviour, three-dimensional linear thermoelasticity problems
- Flat deformations
- Theorem of kinetic energy
- The Theorems of Minimum Potential Energy and Complementary Energy
- Principle of the finite element method in linear elasticity
- Linear elasticity finite element method
- Concepts of Limit Analysis and the Study of Linear Elastic Curvilinear Media

Fluid mechanics
- Eulerian Kinematics
- Euler's equations
- Navier-Stokes equations
- Reynolds Number Irrotational plane flows of perfect incompressible fluid
- Actual and complex potential
- Conformal transformations
- Transformation and Zhukovsky profiles

Physico-chemistry of the states of matter
- Basic mechanical properties and physical origins: Elasticity - Plasticity - Viscosity
- Large classes of materials
- Material structures: pure bodies, suspensions, alloys, foams, emulsions, granulars
- Elementary components and structure scale
- Pure components (Main interactions - van der Waals forces - Thermal agitation - Phase changes - Gaseous, liquid, solid and glassy states - Mechanical behaviour and links with local interactions)
- Interactions with surfaces (Adsorption - Surface tension - Wetting - Contact angle)
- Colloids (Brownian motion - Diffusion - Sedimentation - Colloidal forces: van der Waals, electrostatics, depletion, adsorption of polymers - Stability - Concentration regimes - Mechanical behaviour)

Statistical physics
Calculation of entropy and associated thermodynamic quantities for simple physical systems at equilibrium, in the case of phase transitions and in out-of-equilibrium situations, from microscopic model systems (perfect gas, polymer, two-state systems, etc.).

Probabilities
- Fundamental notions (probability space, random variable, law, expectation, ...)
- Usual laws with real and integer values.
- Concepts of convergence
- Strong Law of Large Numbers
- Central Limit Theorem
- Main algorithms for simulating random variables
- Monte-Carlo method