

Imperial College
London

MSc Applied Computational Science & Engineering



Why study the Applied Computational Science and Engineering MSc?

- Gain programming and foundational domain knowledge combined with advanced numerical literacy.
 - Develop computational and data skills needed in industry and academic research.
 - Take on a unique course:
 - Training on software development for science and engineering applications.
 - Intersection of mathematics, physics, engineering and computing.
 - Research-led teaching
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Expertise in Earth Science & Engineering

The Department has a wide range of computational science and engineering expertise.

- Simulation technologies
- Advanced numerical methods
- Machine learning
- Domain specific languages
- Automatic code generation
- Adjoint-state methods for data-inversion and optimisation problems



What is the course about?

- Model dynamical processes using numerical methods and advanced programming.
- Large scale, big data, machine learning.
- Combining mathematics, physical sciences, engineering, and computational science.
- Preparing tomorrow's technologists, entrepreneurs and computational problem solvers.

“Students will engage with a broad range of trending coding techniques and applications – we will prepare them for success in industry and academia”

Dr Adriana Paluszny
Royal Society University Research Fellow

Course outline

- 12 month MSc course
 - New programme, first intake October 2018 (31 students).
 - Strong emphasis on programming and practical assessment.
 - Students undertake a three month individual research project in academic research lab or industry.
 - Seminar series from academic and industrial researchers.
 - Training workshops – professional development.
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Term 1

- Modern programming methods
- Modelling dynamical processes
- Numerical methods
- Group projects

Term 2

- Advanced programming
- Patterns for parallel programming
- Inversion and optimisation
- Group project

Term 3

- Machine learning
- Group project
- Independent Research Project



Industry Collaborations

- Training workshops
- Careers visits (in 2018/19 this included visits from Microsoft, Improbable, Halliburton and others)
- Hackathons
- Internships



Individual research projects

50 different projects offered in 2018/19

Example topics included:

- Advanced error models for adaptive tidal turbine arrays modelling.
- Machine learning in the geosciences – integrating seismic, well logs and production data.
- Inverting crater clusters on Mars to infer impactor properties in support of the NASA InSight mission.
- Computational methods for radiation transport on supercomputers.
- Optimisation and inversion of large problems in the real world.
- Model reduction using Long Short Term Memory neural networks.

Graduates

- Fill the market demand for those with applied, hands-on computational experience who can solve real world problems.
 - Expert analysts in industry: geoscience, risk management or climate science.
 - Pursue academic careers: computational techniques, optimisation and inversion, fluid mechanics, machine learning applications.
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