

Faraday Institution PhD Cluster Training Plan

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Overview

The Faraday Institution PhD Cluster was formed with the goal of developing future generations of UK scientists and engineers to work in the electrochemical energy storage field. Participants in **the Faraday Institution Phd Cluster** will receive a comprehensive, state-of-the-art training to enhance their research pursuits.

Our training plan combines both practical and theoretical aspects of energy storage research and aspects of materials science; chemistry; computer modelling; electrical, chemical, mechanical and systems engineering, while mixing academic training with application-inspired industrial projects. Further, we provide the PhD Cluster with additional transferable skills in business and operations through an energy storage and automotive focused mini MBA course, delivered in partnership with a leading UK university business school.

The Faraday Institution Phd Cluster offers students, currently enrolled on a doctoral programme among our Fast Start partner set, the opportunity to grow marketable skills, expand their network outside of academic circles, and work alongside Faraday Institution researchers on research projects. Students in the cluster will have access to leaders of industry, academia, and government through monthly lectures as part of our role as the UK's independent, national institution for electrochemical energy storage research. Specifically, we offer:

- Expert-led training in research disciplines central to electrochemical energy storage research
- Access to a range of events, seminars, and workshops delivered by leaders in research, government and industry
- Regular interactions as part of the FI cohort (e.g., journal reading clubs, discussions)
- Opportunities to collaborate on industrial-defined, application-inspired projects with our current and emerging industry partners
- Expert support and mentorships through all stages of the studentship delivered by our partner universities and industry set
- Networking opportunities through the Institution, university and strategic partners
- Access to some of the world-leading technologies and tools for conducting research, such as the Diamond Light Source, the ISIS Pulsed Neutron and Muon Source, and Hartree Centre for HPC.
- A mini MBA course created in partnership with a UK-based business school, focused on the energy storage market.

Skills tracking via InkPath:

Inkpath is a skills and career development app designed at the University of Oxford and spun out of the University in late 2017 and has been described as 'Fitbit for your career'. All students will be required to monitor progress using the InkPath, which provides a structure for progress reporting at stage gates throughout the 4 years (initial objectives, quarterly review, transfer completion, thesis submission etc). Building on this platform, the students will record attendance at training courses,

project work and other enabling activities. The log will be reviewed annually by the FI Training and Diversity Panel and will form a training and experience portfolio for graduating students.

Year 1

Taught Course Training: Over the first year of study, participants in the FI PhD Cluster will take a number of compulsory courses, over a 6-8-week period. Courses will generally consist of lectures and hands-on research or training activities.

Challenge Research Projects: Students will be required to visit the sites of our industrial partners to learn about key problems in industry regarding energy storage. Based on these visits, students will work with industry, in small teams, to define a challenge research project of interest to the students and which address a key aspect of an industrial challenge.

Supervision: Over the first year all students have an academic supervisor who is a member of the core academic staff of their home institution. Students will meet their supervisor regularly throughout this period, as a means of assessing progress and discussing academic issues.

Quarterly Reviews and Annual Workshops: Each quarter, our students will have an opportunity to present the results of their research to other students, industrial partners, and invited researchers from other universities. During our Annual Workshop, we will invite our industrial collaborators to share the latest problems and market trends and discuss opportunities for future collaboration with our students. This allows our students to develop an appreciation to pursue careers in both academic and industrial research settings and to hone their ability to focus on research challenges that may have a direct impact in the marketplace.

Internships and industrial placements: The automotive and battery manufacturing industries will actively participate in the CDT programme via student internships in their labs. Our students will spend 3 months over the course of 4 years in an industrial lab to gain experience in industry-led projects, expand their horizons by engaging in a topic that is related to but not necessarily the same as their thesis.

Years 2-4

Research Techniques and Facilities: Over years 2-4, students will be encouraged to take electives that enhance their abilities to conduct research using some of the world-leading scientific tools and facilities available today.

Year	Compulsory	Course Title
1	Yes	Battery 101
1	Yes	Battery Safety
1	Yes	Battery Manufacturing 1
1	Yes	Outreach
		- Training
		- Stem Ambassadorship
		- Relationship with School
		- Developing content and modules
		- POST fellowships
1	Yes	Group Consulting Project
All	Yes	Special Lectures and Site Visits

1-4	Yes	Industrial Placements
2-4		Battery Manufacturing 2
2-4		Electrochemistry Summer School
2-4		ISIS Neutron Training Course
2-4		Muon Spectroscopy Training School
2-4		Synchrotron Radiation School
2-4		High Performance Computing
2-4		BMS battery integration and protocols
2-4		Bath Electrochemical Impedance Spectroscopy Summer
School		
2-4		Spectroscopy Summer School
2-4		Data Handling and Visualisation
2-4		Crystallography
2-4		Materials Characterisation
2-4		Technoeconomic modelling
2-4		Materials and Theory
2-4		Interoperability
2-4		Life Cycle Analysis
2-4		Policy and Regulation