University of Nottingham

Nanoscale and Microscale Research Centre

Nanoscale and Microscale Research Centre (nmRC)

Training and Development Programme - Autumn 2025

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nmRC Training and Development Programme Autumn 2025

Starting this term, the nmRC training programme is evolving from a seminar series into a highly interactive workshop format, featuring live demos, lab tours, quizzes, and practical case studies.

Theme	Title	Facilitators	Length	Date
Core Electron Microscopy	Intro to SEM and sample preparation	Paul Brown	60 mins	26th November
	Intro to TEM and sample preparation	Paul Brown	60 mins	26th November
	Spectroscopy	Michael Fay and Lorelei Robertson	60 mins	27th November
Advanced Electron Microscopy	Biological sample preparation and cryo-EM	Michael Fay	60 mins	1st December
	FIB-SEM	Chris Parmenter	60 mins	1st December
	In-situ and Variant EM Techniques	Michael Fay	60 mins	3rd December
	Environmental SEM	Nikki Weston	90 mins	5th December
	Transmission Electron Diffraction	Benjamin Weare	60 mins	5th December
Surface analysis and imaging	Intro to XPS	Emerson Kohlrausch and Hannah Constantin	90 mins	24th November
	Analysing data using CasaXPS	Emerson Kohlraush and Hannah Constantin	120 mins	25th November
	Intro to Raman spectroscopy	Graham Rance	90 mins	8th December
	Intro to chemical surface analysis by mass spectrometry	Anna Kotowska and Li Lu (Jennifer)	60 mins	8th December
	Intro to AFM	Long Jiang	60 mins	10th December
Data processing and presentation skills	Image processing and simulation	Michael Fay	60 mins	13th January
	Presenting nmRC images and plots	Michael Fay and Lorelei Robertson	60 mins	15th January
	Science presentation skills	Jesus Molinar Diaz	60 mins	14th January
Nanofabrication	Nanofabrication	Richard Cousins	60 mins	10th December

More detailed descriptions of these workshops are provided below . These seminars are bookable via filling in this form: [nmRC Training Seminar Series Enrolment - Autumn 2025 – Fill in form]

Number of attendees for the workshops are capped, and you will be informed if you are on a waiting list.

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Core Electron Microscopy

Intro to SEM and Sample Preparation

Facilitator: Prof. Paul Brown

Date: 1-2pm, Wednesday 26th November

Format: Lecture, videos, case studies

This course is designed for electron microscopy users at the nmRC and is suited ideally for novice users or those wanting refresher training. This course will cover:

- Introduction to the nmRC
- Introduction to Scanning Electron Microscopy (SEM)
- Overview of SEM instrumentation
- Introduction to sample preparation for SEM
- Strategies for handling bulk, thick/thin film (plan-view/cross-section) and particulate materials
- Strategies for handling hard, soft and temperature sensitive materials
- Cleaning protocols/plasma cleaning

Intro to TEM and Sample Preparation

Facilitator: Prof. Paul Brown

Date: 2-3pm, Wednesday 26th November

Format: Lecture, videos, case studies

This course is designed for electron microscopy users at the nmRC and is suited ideally for novice users or those wanting refresher training. This course will cover:

- Introduction to the nmRC
- Introduction to Transmission Electron Microscopy (TEM)
- Overview of TEM instrumentation
- Introduction to sample preparation for TEM
- Strategies for handling bulk, thick/thin film (plan-view/cross-section) and particulate materials
- Strategies for handling hard, soft and temperature sensitive materials
- Cleaning protocols/plasma cleaning

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Core Electron Microscopy

Spectroscopy

Facilitator: Dr Michael Fay and Lorelei Robertson

Date: 1pm, Thursday 27th November

Format: lecture with demo of EDX software (Oxford Instruments Aztec) and WDS software (Oxford Instruments AztecWave). No prior knowledge of this software is required.

An introduction to element identification and analysis in the electron microscope, giving an understanding of the physical processes, sample preparation needed, and the data obtained.

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Advanced Electron Microscopy

Biological Sample Preparation and Cryo-EM

Facilitator: Dr Michael Fay

Date: 11-12pm, Monday 1st December

Format: Lecture

This course provides an introduction to Electron Microscopy under cryogenic conditions (cryo-EM) and is designed for people wishing to image tissues, cells or hydrated materials and includes:

- Introduction to Cryo-EM instrumentation (basics & capabilities, and sample handling
- An overview of staining, fixation and embedding techniques
- An overview of drying, freezing and environmental SEM
- An overview of trimming, sectioning and focused ion beam milling
- An introduction to 3D strategies
- Correlation between techniques

FIB-SEM

Facilitator: Dr Chris Parmenter

Date: 2.30-3.30pm, Monday 1st December

Format: Lecture, demo, case studies

This course provides and introduction to Focused Ion Beam Scanning Electron Microscopy (FIB-SEM) and is intended for novice users of this instrumentation. The course will cover:

- Introduction to FIB-SEM and associated instrumentation (basics & capabilities)
- Specialist sample preparation and handling
- Application examples

In-situ and Variant EM Techniques

Facilitator: Dr Michael Fay

Date: 2-3pm, Wednesday 3rd December

Format: Lecture, case studies

This course is designed for electron microscopy users at the nmRC. This will cover an introduction to *in-situ* techniques for SEM and TEM—including Electron Backscatter Diffraction (EBSD), hot-stage, strain-stage, electron beam induced current (EBIC), Cathodoluminescence (CL), tomography, and magnetic (Lorentz) TEM.

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Advanced Electron Microscopy

Environmental SEM

Facilitator: Nicola Weston

Date: 1-2.30pm, Friday 5th December

Format: Lecture, demo with wet samples, case studies

This course provides an introduction to Environmental SEM. The course will cover:

- Introduction to ESEM instrumentation (basics & capabilities)
- Specialist sample preparation and handling

Transmission Electron Diffraction

Facilitator: Dr Ben Weare

Date: 3-4pm, Friday 5th December

Format: lecture, with questions to audience throughout
This course is designed for transmission electron microscope users with an interest in using electron diffraction, and people working with crystalline materials who want to find out how electron diffraction can be used to benefit their work.

Content:

- Recap what crystals are, and why they are studied with diffraction.
- How to perform selected area electron diffraction, how to process diffraction data, and what electron diffraction tells you about your materials.
- Discussion of solving crystal structures with three-dimensional electron diffraction (3DED).

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Surface Analysis and Imaging

Intro to XPS

Facilitators: Dr Hannah Constantin and Dr Emerson Kohlrausch

Date: 2-3.30pm, Monday 24th November

Format: Fundamental principles, case studies and lab demo

This course provides an overview of the principles of x-ray photoelectron spectroscopy (XPS), provides some XPS case studies, and finishes with a lab tour/demonstration in nmRC B16. Ideal for students/staff considering using the technique, or trained XPS users.

Analysing data using CasaXPS

Facilitators: Dr Hannah Constantin and Dr Emerson Kohlrausch

Date: 2-4pm, Tuesday 25th November

Format: Data Analysis workshop

This will be an informal workshop focussed on using CasaXPS for data analysis. Suitable for beginners and advanced users alike, this workshop will be an opportunity to get started with the software, or seek assistance with any issues you might be having. In advance of this workshop, instructions for downloading CasaXPS will be emailed out.

Intro to Raman Spectroscopy

Facilitator: Dr Graham Rance

Date: 10-11.30am, Monday 8th December

Format: Quiz, Tour, Videos, Case Studies

This course provides an overview of the principles of Raman spectroscopy and imaging, their applications in nanoscale and microscale materials characterisation. It is ideal for researchers considering applying the technique to their research and/or to complement the practical training received by users of the Raman spectroscopy instrumentation at the nmRC. On completion attendees will be able to:

- Describe the main differences between infrared and Raman spectroscopies.
- Define the Raman effect and describe how it can be used to study vibrational states.
- Describe the information that can be obtained from a Raman spectrum.
- Describe the information that can be obtained from a Raman image.
- Define the main components of the confocal Raman microscope.
- Define spectral and spatial resolution and describe how they can be controlled.

Attendees will be required to study pre-recorded videos and participate in an interactive quiz and tour as part of the in-person workshop.

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Surface Analysis and Imaging

Intro to chemical surface analysis by mass spectrometry

Facilitators: Dr Anna Kotowska, Dr Li Lu (Jennifer), Dr Nichola Starr

Date: 2-3pm, Monday 8th December

Format: Lecture, videos, case studies

This course provides an introduction to the surface chemical analysis techniques: time of flight secondary ion mass spectrometry (ToF-SIMS) and Orbitrap secondary ion mass spectrometry (OrbiSIMS). It is intended for novice users of this instrumentation or those with an interest in the technique. This workshop will cover:

- Introduction to ToF SIMS and 3D OrbiSIMS theory and instrumentation (basics and capabilities)
- Familiarisation with SIMS facilities available at the nmRC and elsewhere.
- Theoretical basis for techniques based on ToF-SIMS
- Functionality of specific instrumentation
- Practical applications of ToF-SIMS techniques

Intro to AFM

Facilitator: Dr Long Jiang

Date: 11am-12pm, Wednesday 10th December

Format: Lecture, quiz

This course is designed for AFM users at the University of Nottingham and is suited ideally for novice users or those wanting refresher training. This course will cover:

- Background to AFM
- How AFM works
- What information AFM can provide
- Where to access AFM at UoN

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Data Processing and Presentation Skills

Image Processing and Simulation

Facilitator: Dr Michael Fay

Date: 1-2pm, Tuesday 13th January

Format: Lecture with live demo of image processing (using FIJI version of ImageJ, and Python). Some prior knowledge of this software may be useful but is not required.

This workshop is about how to process images and spectra from the nmRC equipment to visualise, extract, store, model, and present scientific data

Presenting nmRC Images and Plots

Facilitators: Dr Michael Fay and Lorelei Robertson

Date: 1-2pm, Thursday 15th January

Format: Lecture with live demo of processing data using Python; colourisation of EM data using Affinity Photo (available from the University of Nottingham Software Library). Some knowledge of this software may be useful but is not required.

This workshop is about how to take images and spectra from the nmRC instruments and prepare them for publication and presentation to the scientific community and the wider public.

Science Presentation Skills

Facilitator Dr Jesus Molinar Diaz

Date: 10-11am, Wednesday 14th January

Format: Lecture

This course is designed for scientists at all levels who want to develop the way they present their research. This course will cover:

- Tips and tricks for creating engaging presentations and producing smart plots and figures
- How to adapt a presentation to be aimed at various types of audiences
- Examples of how to break up complexity within a PowerPoint slide

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Nanofabrication

Nanofabrication

Facilitator: Dr Richard Cousins

Date: 3-4pm, Wednesday 10th December

Format: The session will consist of a 30 minute introduction to nanofabrication, 15 minutes of case studies and 15 minutes working together on creating a fabrication flow for your project.

A magical mystery tour through the world of nanofabrication which will provide you with all the information to integrate nanofabrication into your projects. The session is aimed at anyone who is interested in nanofabrication and no previous knowledge is needed. A variety of case studies will be available to demonstrate how we can help with projects from engineering to physics to life science and chemistry.

There are no prerequisites for the course but attendees are welcome to come with details on a potential nanofabrication project.

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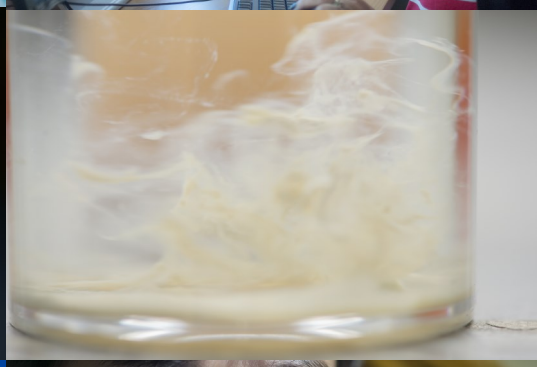


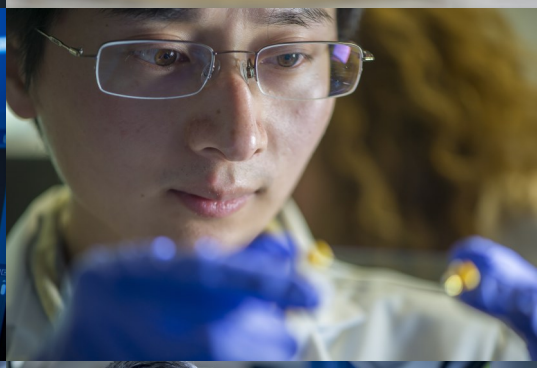

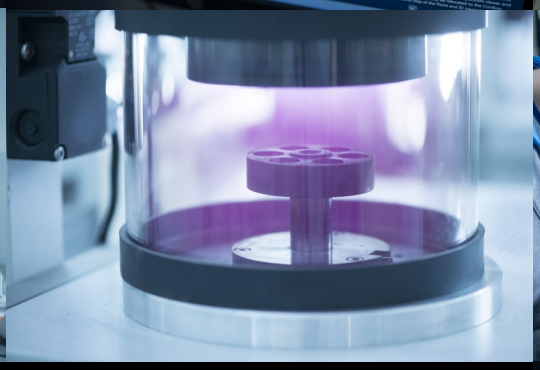

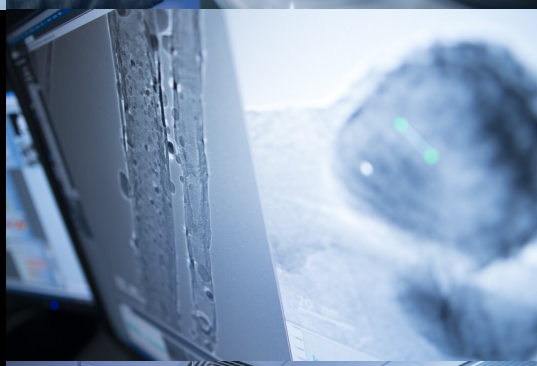


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