Nanoscale and Microscale Research Centre (nmRC)

Seminar Series - Spring 2025

University of Nottingham
Nanoscale and Microscale Research Centre

nmRC Seminar Series Spring 2025

The nmRC will be running several in-house seminars for analytical and fabrication specialisms. All seminars are 1-2pm unless otherwise stated.

Seminar Title	Tutor	Date (Time 1pm unless stated otherwise)
EM: Spectroscopy	Michael Fay	01/05/25
Electron Beam Lithography	Richard Cousins	06/05/25
EM: Intro to SEM and SEM Sample Prep	Paul Brown	07/05/25 9.30am-11am
EM: Intro to TEM and TEM Sample Prep	Paul Brown	07/05/25 11am-12.30pm
EM: Biological Sample Prep & Cryo-EM	Ian Cardillo-Zallo	08/05/25
FIB-SEM	Chris Parmenter	09/05/25
EM: Image Processing & Simulation	Michael Fay	13/05/25
Atomic Force Microscopy	Long Jiang	14/05/25
Raman Spectroscopy: Intro *	Graham Rance	15/05/25
EM: In-situ Techniques	Michael Fay	20/05/25
EM: Transmission Electron Diffraction	Ben Weare	21/05/25 11am-12pm
Surface Analysis with ToF-SIMS	Anna Kotowska, Jennifer Lu	22/05/25
Raman Spectroscopy: Advanced *	Graham Rance	27/05/25
Science Presentation Skills	Luke Norman	28/05/25
Ellipsometry	Richard Cousins	29/05/25
EM: WDS & MLA	Lorelei Robertson	03/06/25
Presenting nmRC Images & Plots	Michael Fay	04/06/25
ESEM	Nicola Weston	05/06/25
An Introduction to Tip Enhanced Raman Spectroscopy	James Kerfoot	06/06/25

More detailed descriptions of these seminars are provided below . These seminars are bookable via filling in this form: https://forms.office.com/e/WYU0uYR5eb

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Once you have submitted the online form, your booking is confirmed unless you receive an email to say you are on the waiting list.

Please note:

- Delivery of the live sessions will take place in A05, Cripps South Building, University Park.
- Places for these seminars are limited to 25. If oversubscribed you will be put on a waiting list and will receive an email should a spot become open.
- Seminars marked * require attendees to watch video recordings on Moodle in advance of attending the seminar. All other seminars will have video recordings made available afterwards to those who attended the seminar.

1: Electron Microscopy: Spectroscopy

When: **Thursday 1st May 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr Michael Fay**

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 principles and applications of spectroscopy within the field of electron microscopy
⇒ An overview of the spectroscopy techniques of Energy Dispersive X-Ray Spectroscopy (EDS) and Wavelength Dispersive X-Ray Spectroscopy (WDS) in SEM.
⇒ An overview of the spectroscopy techniques of EDS and Electron Energy Loss Spectroscopy (EELS) in TEM.

2: Electron Beam lithography (EBL)

When: **Tuesday 6th May 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr Richard Cousins**

This course is designed as an introduction as to what is possible with EBL and is aimed at novice and potential users of EBL. It will cover:

⇒ Basic principles of EBL, and how exposures are performed.
⇒ What is possible to do with EBL, and how to prepare samples and designs.
⇒ How to combine EBL with a range of other nanofabrication techniques to create a wide range of structures.
⇒ How to use EBL and maskless lithography to create Microfluidic devices.

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3: Electron Microscopy: Introduction to Scanning Electron Microscopy (SEM) and SEM Sample Prep

When: **Wednesday 7th May 2025, 9.30am-11am**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Prof Paul Brown**

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.

4: Electron Microscopy: Introduction to Transmission Electron Microscopy (TEM) and TEM Sample Prep

When: **Wednesday 7th May 2025, 11am-12.30pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Prof Paul Brown**

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.

5: Electron Microscopy: Biological Sample Preparation & Cryogenic-Electron Microscopy

When: **Thursday 8th May 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Ian Cardillo-Zallo**

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 focussed ion beam milling
⇒ An introduction to 3D strategies
⇒ Correlation between techniques

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6: Electron Microscopy: Focused Ion Beam Scanning Electron Microscopy (FIB-SEM)

When: **Friday 9th May 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr Chris Parmenter**

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

⇒ Introduction to FIBSEM and associated instrumentation (basics & capabilities) .
⇒ Specialist sample preparation and handling.
⇒ Application examples.

7: Electron Microscopy: Image Processing & Simulation

When: **Tuesday 13th May 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr Michael Fay**

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 digital images and image processing
⇒ Introduction to image simulation

8: Atomic Force Microscopy (AFM)

When: **Wednesday 14th May 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr Long Jiang**

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 can AFM provide
⇒ Where to access AFM at UoN

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9: Raman Spectroscopy: Introduction *

When: **Thursday 15th May 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr Graham Rance**

This course provides an overview of the principles of Raman spectroscopy and imaging, their application in nanoscale and microscale materials characterisation. Ideal for students/staff considering using the technique or as a complement to the practical training received by users of the Raman spectroscopy laboratories (B14 and B15) at the Nanoscale and Microscale Research Centre (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.

10: Electron Microscopy: *In Situ* Techniques

When: **Tuesday 20th May 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr Michael Fay**

This course is designed for electron microscopy users at the nmRC and is suited ideally for novice users wanting refresher training or introduction to a variety of complementary EM techniques. This course will cover:

⇒ Introduction to *in situ* techniques for SEM - including EBSD, hot-stage, strain-stage, EBIC, CL

11: Electron Microscopy: Transmission Electron Diffraction

When: **Wednesday 21st May 2025, 11am-12pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr Ben Weare**

This course is designed for transmission electron microscopy users at the nmRC, suited for those with an interest in electron diffraction measurements. This course will cover:

⇒ Overview of crystallography and the origin of diffraction from crystals
⇒ Differences between X-ray and electron diffraction
⇒ Explanations of data collection and processing for selected area electron diffraction (SAED) and three dimensional electron diffraction (3DED).

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12: Surface Analysis with Time-of-Flight Secondary Ion Mass Spectrometry and 3D OrbiSIMS

When: **Thursday 22nd May 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr Anna Kotowska and Jennifer Lu**

This course provides an introduction to the surface chemical analysis techniques Time of flight Secondary Mass Spectrometry (ToF SIMS) and 3D OribSIMS. It is intended for novice users of this instrumentation or those with an interest in the technique. The seminar will cover:

⇒ Introduction to ToF SIMS and 3D OrbiSIMS theory and instrumentation (basics & 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.

13: Raman Spectroscopy: Advanced *

When: **Tuesday 27th May 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr Graham Rance**

This course provides an advanced overview of the instrumentation used for Raman spectroscopy and imaging, how it can optimised for nanoscale and microscale materials characterisation and is intended to complement the practical training received by users of the Raman spectroscopy laboratories (B14 and B15) at the Nanoscale and Microscale Research Centre (nmRC). This training is designed for those with an understanding of the principles of Raman spectroscopy and current users of instrumentation.

14: Science Presentation Skills

When: **Wednesday 28th May 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr Luke Norman**

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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15: Ellipsometry

When: **Thursday 29th May 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr Richard Cousins**

This course is designed to give an introduction to ellipsometry as a tool to measure thin films. This course will cover:

⇒ Basic explanation of the physics behind ellipsometry
⇒ What can be measured via ellipsometry.
⇒ What can be measured via the nmRC's ep4 imaging ellipsometer
⇒ How to use the ep4 imaging ellipsometer

16: Electron Microscopy: Wavelength Dispersive X-ray Spectroscopy (WDS) & Mineral Liberation Analysis (MLA)

When: **Tuesday 3rd June 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Lorelei Robertson**

This course provides an introduction to wave dispersive spectrometers (WDS) and their uses in SEM and in electron microprobes (EPMA). An introduction to electron microprobes will also be covered. The course will also introduce the technique of mineral liberation analysis SEM (MLA-SEM) for phase analysis.

⇒ Introduction to EPMA theory and instrumentation (basics & capabilities)
⇒ Introduction to MLA-SEM theory and instrumentation (basics & capabilities)

17: Presenting nmRC Images and Plots

When: **Wednesday 4th June 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr Michael Fay**

This course is designed for users of the nmRC and is suited for those needing an introduction and overview to techniques used to communicate data or information clearly by figures and graphs.

⇒ Principles of micrograph image adjustment for presentation
⇒ Overview of presentation of plots
⇒ How to consider the audience in presenting your data

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18: Electron Microscopy: Environmental Scanning Electron Microscopy (ESEM)

When: **Thursday 5th June 2025, 12pm-1pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Nikki Weston**

This course provides an introduction to Environmental Scanning Electro n Microscopy (ESEM) and is intended for novice users of this instrumentation. The course will cover:

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

19: An Introduction to Tip Enhanced Raman Spectroscopy

When: **Friday 6th June 2025, 1pm-2pm**
Where: **A05, Cripps South Building, University Park**
Course Tutor: **Dr James Kerfoot**

In this seminar, we will introduce fundamental concepts essential to tip enhanced Raman spectroscopy. From a quick review of the state-of-the-art in nanoscale optical imaging, we will cover the advantages and disadvantages of TERS and why we may want to use it to address a given scientific challenge.
From there we will introduce concepts in optics and plasmonics which underpin TERS before looking at several case studies which demonstrate the kind of information the technique can be used to deliver.

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