

RMS EM Spring School PHYSICAL SCIENCES: SEM and TEM Programme

Day/Time	Lecture (L)/ Practical (P)	Lecturer	Location
Monday 4 July			
08.30 – 09.00	Registration	RMS	HS Foyer
09.00 – 9.30	Introduction to the Course and meeting Lecturers	RB	EE 1.52
09.30 - 10.30	L – Principles of Microscopy	PJE	EE 1.52
10.30 - 11.00	Tea/Coffee		HS Coffee Bar
11.00 - 12.00	P – Microscopy Principles/Diffraction	PJE	EE 1.52
12.00 – 13.00	L – Principles of Electron Microscopy	RB	EE 1.52
12.30 – 13.30	Lunch		HS Coffee Bar
13.30- 14.30	L – Image Recording	NW	EE 1.52
14.30 – 15.30	L –Vacuum Systems	SKC	EE 1.52
15.30 – 16.00	Tea/Coffee		HS Coffee Bar
16.00 – 17.00	P – Introduction to EM Units (LEMAS and Manton) and discussion of requirements/ demo groups.	RB/JPH/RW MBW/APB PW/MF/SKC /KS	LEMAS + Manton
17.15 – 18.15	L – Electron Beam/ Specimen Interactions	RB	EE 1.52
19.30	Dinner Akbars Indian Restaurant		

Day/Time	Lecture (L)/ Practical (P)	Lecturer	Location
Tuesday 5 July			
09.00 – 10.00	L - Practical Electron optics	SKC	EE 1.52
10.00 – 11.00	L – Principles of SEM	RB	EE 1.52
11.00 – 11.30	Tea/Coffee		HS Coffee Bar

11.30 – 12.30	L – 21st Century SEM	SKC	EE 1.52
12.30 – 13.30	Lunch		HS Coffee Bar
13.30 – 14.30	L – Principles of TEM	RB	EE 1.52
14.30 – 15.30	P – Basics of TEM <i>or</i> P - Basics of SEM	MBW/NH/ NWilkinson RW/JPH	LEMAS
15.30 – 16.00	Tea/Coffee		HS Coffee Bar
16.00 – 17.00	P - Basics of SEM <i>or</i> P – Basics of TEM	JPH/RW MBW/NH NWilkinson	LEMAS
19.00	Dinner Whitelocks Pub		
Day/Time	Lecture (L)/ Practical (P)	Lecturer	Location
Wednesday 6 July			
09.00 – 10.00	L – SEM/TEM sample preparation for Materials	RB	EE 1.52
10.00 – 11.00	P – SEM/TEM sample preparation 1 Polishing – Buehler; Electropolishing (2 groups swop?); TEM X-Sections -MM Consumables – Agar;	JPH/RW/ MBW/RB/ APB/MM/ NH/ MK Buehler HD ?	Room 1.18 HS Room 1.39 HS LEMAS
11.00 - 11.30	Tea/Coffee		HS Coffee Bar
11.30 – 12.30	P – SEM/TEM sample preparation 2 Sputter coating – RW; Evaporation – JH; Ion Beam Thining – RB/MBW ; Microtomy – MBW/APB; Carbon coating (2 groups?)	JPH/RW/ MBW/RB/ APB/MM/ NH/ MK Buehler HD ?	LEMAS
12.30 – 13.30	Lunch		HS Coffee Bar
13.30 – 14.30	L – Crystallography and Electron Diffraction	AJS	EE 1.52
14.30 – 15.30	L- EBSD	GL	EE 1.52
15.30 – 16.00	Tea/Coffee		HS Coffee Bar
16.00 – 17.30	P – EBSD demo	GL/ Ox.Inst. ?	LEMAS
	P - Electron Diffraction demo	MBW	LEMAS
	Free Evening		

Day/Time	Lecture (L)/ Practical (P)	Lecturer	Location
Thursday 7 July			
09.00 – 10.00	L - EDX General Principles including Thin film EDX	RB	EE 1.52
10.00 – 11.00	P – EDX in the SEM P - EDX in the TEM and STEM	JPH/RW/EC MBW/NH	LEMAS
11.00 – 11.30	Tea/Coffee		HS Coffee Bar
11.30 – 12.30	L – Focused Ion Beam	MS	EE 1.52
12.30 – 13.30	Lunch		HS Coffee Bar
13.30 – 15.00	P – FIB demo	MS JPH/ MBW	LEMAS
15.00 – 15.30	Tea/Coffee		HS Coffee Bar
15.30 – 16.30	L – High Resolution TEM	APB	EE 1.52
16.30 – 17.30	P – HRTEM and Electron Diffraction demo	MBW/NH APB/RB	LEMAS
18.15	Drinks and Lecture		EE 1.52
	Kay Grunewald – Title TBC		
20.00	Dinner at Casa Mia Millenium		
Day/Time	Lecture (L)/ Practical (P)	Lecturer	Location
Friday 8 July			
09.00 – 10.00	L – EELS Principles	RB	EE 1.52
10.15 – 11.15	L – Environmental SEM	RW	EE 1.52
11.15 – 11.45	Tea/Coffee		HS Coffee Bar
11.45 – 13.00	P – ESEM demo P – EELS/EFTEM demo	RW MBW/NH	LEMAS
13.00 – 14.00	L – Electron Tomography	RL	EE 1.52
14.00 – 15.00	Lunch		HS Coffee Bar
15.00 – 16.30	Time for examination of specimens Discussion	JPH/RW/RB/ MBW/NH	LEMAS
	Course Ends		

RMS EM Spring School

ELECTRON MICROSCOPY for the BIOLOGICAL SCIENCES: SEM and TEM

Programme

Day/Time	Lecture (LT)/ Practical (P)	Lecturer	Location
<i>Monday 4 July</i>			
08.30 – 09.00	Registration	RMS	HS Foyer
09.00 – 9.30	Introduction to the Course and meeting lecturers	RB	EE 1.52
09.30 - 10.30	L – Principles of Microscopy	PJE	EE 1.52
10.30 - 11.00	Tea/Coffee		HS Coffee Bar
11.00 - 12.00	P – Microscopy Principles/Diffraction	PJE	EE 1.52
12.00 – 13.00	L – Principles of Electron Microscopy	RB	EE 1.52
12.30 – 13.30	Lunch		HS Coffee Bar
13.30- 14.30	L – Image Recording	NW	EE 1.52
14.30 – 15.30	L –Vacuum Systems	SKC	EE 1.52
15.30 – 16.00	Tea/Coffee		HS Coffee Bar
16.00 – 17.00	P – Introduction to EM Units (LEMAS and Manton) and discussion of requirements/ demo groups.	RB/JPH/RW/ MBW/APB PW/MF/SKC /PCH	LEMAS + Manton
17.15 – 18.15	L – Electron Beam/ Specimen Interactions	RB	EE 1.52
19.30	Dinner Akbars Indian Restaurant		
Day/Time	Lecture (L)/ Practical (P)	Lecturer	Location
<i>Tuesday 5 July</i>			
09.00 – 10.00	L - Practical Electron optics	SKC	EE 1.52
10.00 – 11.00	L – Principles of SEM	RB	EE 1.52
11.00 – 11.30	Tea/Coffee		HS Coffee Bar
11.30 – 12.30	L – 21st Century SEM	SKC	EE 1.52

12.30 – 13.30	Lunch		HS Coffee Bar
13.30 – 14.30	L – Principles of TEM	RB	EE 1.52
14.30 – 15.30	P – Basics of TEM P - Basics of SEM	MF/PW/SKC	Manton
15.30 – 16.00	Tea/Coffee		Manton
16.00 – 17.00	P - Basics of SEM P – Basics of TEM	MF/PW/SKC	Manton
19.00	Dinner Whitelocks Pub		

Day/Time	Lecture (L)/ Practical (P)	Lecturer	Location
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Wednesday 6 July

09.00 – 10.00	L – SEM/TEM sample preparation for Biology 1	PCH	Worsley Room 9.57
10.00 – 11.00	L – SEM/TEM sample preparation for Biology 2	PCH	Worsley Room 9.57
11.00 - 11.30	Tea/Coffee		Manton
11.30 – 12.45	P – Coating grids/Glow discharge /Negative Staining	PW/SM/MF	Manton
12.45 – 13.30	Lunch		Manton
13.30 – 15.30	P – Optimising TEM performance /Chemical fixation	SKC/PCH	Manton
15.30 – 16.00	Tea/Coffee		Manton
16.00 – 17.30	P – Optimising SEM performance	SKC	Zeiss SEM LEMAS
Free Evening			

Day/Time	Lecture (L)/ Practical (P)	Lecturer	Location
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Thursday 7 July

09.00 – 10.00	L - Cryo-TEM	NR	Worsley Room 9.57
10.00 – 11.00	P – Cryo-TEM demo	KS	Manton
11.00 – 11.30	Tea/Coffee		Manton
11.30 – 12.15	L – Bioimaging at Leeds	MP	Worsley Room 9.57
12.15 – 12.45	P – Cryo-TEM demo	KS	Manton
12.45 – 13.30	Lunch		Manton

13.30 – 14.30	L – Cryo-SEM	KF	Worsley Room 9.57
14.30 – 15.30	L – Immunogold labelling	PV	Worsley Room 9.57
15.30 – 16.00	Tea/Coffee		Manton
16.00 – 17.30	P – Cryo-sectioning demo	GJ Leica	Manton
	P – Cryo-SEM demo	KF/MF/Quorum	Manton
18.15	Drinks and Lecture		EE 1.52
	Kay Grunewald – Title TBC		
20.00	Dinner at Casa Mia Millenium		

Day/Time	Lecture (L)/ Practical (P)	Lecturer	Location
<i>Friday 8 July</i>			
09.00 – 10.00	L – Biological EDX <i>or</i> EELS Principles	AW RB	EE 3.52 EE 1.52
10.15 – 11.15	L – Environmental SEM	RW	EE 1.52
11.15 – 11.45	Tea/Coffee		HS Coffee Bar
11.45 – 13.00	P – ESEM demo P – Bio EDX/EELS demo	RW MBW/NH	LEMAS LEMAS
13.00 – 14.00	L – Electron Tomography	RL	EE 1.52
14.00 – 15.00	Lunch		HS coffee bar
15.00 – 16.30	Time for examination of specimens Discussion	JPH/RW/RB/ MBW/NH	LEMAS

RMS EM Spring School

PHYSICAL SCIENCES: Advanced TEM Programme

Day/Time	Lecture (LT)/ Practical (P)	Lecturer	Location
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Monday 4 July

08.45 – 09.00	Registration	RMS	HS Foyer
09.00 – 9.30	Introduction to the Course and meeting lecturers	RB	EE 1.52
09.30 - 10.30	L – Principles of Microscopy	PJE	EE 1.52
10.30 - 11.00	Tea/Coffee		HS Coffee Bar
11.00 - 12.00	P – Microscopy Principles/Diffraction	PJE	EE 1.52
12.00 – 13.00	L – Principles of Electron Microscopy	RB	EE 1.52
12.30 – 13.30	Lunch		HS Coffee Bar
13.30- 14.30	L – Image Recording	NW	EE 1.52
14.30 – 15.30	L –Vacuum Systems	SKC	EE 1.52
15.30 – 16.00	Tea/Coffee		HS Coffee Bar
16.00 – 17.00	P – Introduction to EM Units (LEMAS and Manton) and discussion of requirements/ demo groups.	RB/JPH/RW MBW/APB PW/MF/SKC /KS	LEMAS + Manton
17.15 – 18.15	L – Electron Beam/ Specimen Interactions	RB	EE 1.52
19.30	Dinner Akbars Indian Restaurant		

Day/Time	Lecture (L)/ Practical (P)	Lecturer	Location
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Tuesday 5 July

09.00 – 10.00	L – Practical Electron Optics	SKC	EE 1.52
10.00 – 11.00	L - Principles of STEM	QMR	EE 3.52
11.00 – 11.30	Tea/Coffee		HS Coffee Bar
11.30 – 12.30	P – WEBDemo + STEM demo	QMR/MBW	EE 3.52 LEMAS

12.30 – 13.30	Lunch		HS Coffee Bar
13.30 – 14.30	L – Principles of TEM	RB	EE 1.52
14.30 – 15.30	P – Advanced TEM	NH/MBW N Wilkinson	LEMAS
15.30 – 16.00	Tea/Coffee		HS Coffee Bar
16.00 – 17.00	P – Advanced TEM	NH/MBW NWilkinson	LEMAS
19.00	Dinner Whitelocks Pub		

Day/Time	Lecture (L)/ Practical (P)	Lecturer	Location
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Wednesday 6 July

09.00 – 10.00	L – SEM/TEM sample preparation for Materials	RB	EE 1.52
10.00 – 11.00	P – SEM/TEM sample preparation 1 Polishing – Buehler; Electropolishing ?); TEM X-Sections -MM (2 groups swop?) Consumables – Agar;	JPH/RW/ MBW/RB/ APB/MM/ NH/ MK Buehler HD ?	I.18 HSEMAS

11.00 - 11.30	Tea/Coffee		HS Coffee Bar
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11.30 – 12.30	P – SEM/TEM sample preparation 2 Sputter coating – RW; Evaporation – JH; Ion Beam Thining – RB/MBW ; Microtomy – MBW/APB; carbon coating (2 groups?)	JPH/RW/ MBW/RB/ APB/MM/ NH/ MK Buehler HD ?	LEMAS
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12.30 – 13.30	Lunch		HS Coffee Bar
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13.30 – 14.30	L – Crystallography and Electron Diffraction	AJS	EE 1.52
14.30 – 15.30	P - Electron Diffraction demo (Adv)	MBW/AJS	LEMAS

15.30 – 16.00	Tea/Coffee		HS Coffee Bar
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16.00 – 17.30	P – Crystallography/ Electron diffraction problem solving	AJS	LEMAS
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	Free Evening		
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Day/Time	Lecture (L)/ Practical (P)	Lecturer	Location
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Thursday 7 July

09.00 – 10.00	L - EDX General Principles including Thin film EDX	RB	EE 1.52
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10.00 – 11.00	P - EDX in the TEM and STEM	MBW/NH Agar HD	LEMAS
11.00 – 11.30	Tea/Coffee		HS Coffee Bar
11.30 – 12.30	L – Focused Ion Beam	MS	EE 1.52
12.30 – 13.30	Lunch		HS Coffee Bar
13.30 – 15.00	P – FIB demo	JPH/MS MDW	LEMAS
15.00 – 15.30	Tea/Coffee		HS Coffee Bar
15.30 – 16.30	L – High Resolution TEM	RB	EE 1.52
16.30 – 17.30	P – Advanced HRTEM demo P – Image simulation	MBW/NH CS	LEMAS
18.15	Drinks and Lecture		EE 1.52
	Kay Grunewald – Title TBC		
20.00	Dinner at Casa Mia Millenium		

Day/Time	Lecture (L)/ Practical (P)	Lecturer	Location
Friday 8 July			
09.00 – 10.00	L – EELS Principles	RB	EE 1.52
10.00 – 11.15	P – EELS/EFTEM demo (Advanced)	MBW	LEMAS
11.15 – 11.45	Tea/Coffee		HS Coffee Bar
11.45 – 12.45	L – EELS advanced and thin film EDX	RB	EE 1.52
13.00 – 14.00	L – Electron Tomography	RL	EE 1.52
14.00 – 15.00	Lunch		HS Coffee Bar
15.00 – 16.30	Time for examination of specimens Discussion	JPH/RW/RB MBW/NH	LEMAS

Key

Lecturers and Demonstrators:

Code	Lecturer	Code	Lecturer
AJS	Andrew Scott	MS	Miroslava Schaffer
APB	Andy Brown	NH	Nicole Hondow
AW	Alice Warley	NR	Neil Ranson
CS	Che Seabourne	NW	Neil Wilkinson
EC	Eric Condliffe	OxInst	Oxford Instruments Rep
GJ	Gareth Jackson (Leica)	PCH	Pippa Hawes
GL	Geoff Lloyd	PJE	Peter Evennett
HD	Heather Dyson (Quorum)	PV	Paul Verkade
JPH	John Harrington	PW	Peiyi Wang
KF	Kim Findlay	QMR	Quantin Ramasse
KS	Kasim Sader	RB	Rik Brydson
MBW	Mike Ward	RL	Rowan Leary
MF	Martin Fuller	RW	Richard Walshaw
MK	Mike Keeble (Buehler)	SKC	Steve Chapman
MM	Mathew Maclaren	SM	Stephen Muench

Locations:

HS – Houldsworth School: coffee bar and entrance foyer

LEMAS – Houldsworth School EM Unit – Basement HS

EE 1.52 – Agilent lecture Theatre in Electrical Engineering First floor (2 mins walk from Houldsworth - Under cover)

EE 3.52 – Seminar room in Electrical Engineering Third floor (2 mins walk from Houldsworth)

Manton – Biology EM Unit – Manton Building

Worsley Room 9.57 – Worsley Building Seminar Room, 9.57