

## Guidelines for the use of the online bridging programme by Materials Science students

As explained in the main introduction to the bridging website, there are five separate courses available to you: Maths Bridging Programme, Chemistry Bridging Programme, Physics Bridging Programme, Computing and Study Skills and Laboratory Work. The Laboratory Work and Study Skills programmes are relevant for students of all subjects but the parts of the other three programmes that are relevant to you depend on your degree. So, before you start, please read the advice below.

### **Maths Bridging Programme**

The topics in the 'essential' column are the ones you should be familiar with before the commencement of your course. Where stated, there might be a chance to catch up on some of these topics in tutorials.

Topics in the 'helpful if students know this' are taught in the first year, but are covered quickly, so if you are not already familiar with them it would be advisable to study them in advance.

<b>Topic</b>	<b>Essential knowledge</b>	<b>Helpful if students know this</b>	<b>Not needed before students start</b>
<b>1. Basic geometry, trigonometry and misc. Functions</b>			
1.1 Basic geometry	✓		
1.2 Binomial expansion, Taylor/Maclaurin series, use in finding limits	✓		
1.3 Sums of geometric and arithmetic progressions	✓ (might be a chance to catch this up in tutorials)		
1.4 Sine, cosine, tangent	✓		
1.5 Important functions	✓		
Extension material: Proof by induction			✓
<b>2. Vectors and matrices</b>			
2.1 Vectors and scalars	✓		
2.2 Resolving vectors		✓	

2.3 Scalar and vector products		✓	
2.4 Matrices – adding and multiplying of matrices by scalar		✓	
2.5 Matrices – multiplying matrices		✓	
2.6 Definition of the determinant and finding the inverse of a 2x2 matrix			✓
Extension material: Inverse of 3x3 matrix and solving simultaneous equations			✓
Introduction to linear algebra			✓
<b>3. Differentiation</b>			
3.1 Derivative defined via slope of curve	✓		
3.2 Differentiation of basic functions	✓		
3.3 Products and quotients	✓		
3.4 The chain rule	✓		
3.5 Use of differentiation to find stationary points + curve sketching	✓		
Extension material: Implicit differentiation	✓		
<b>4. Integration</b>			
4.1 Integration in general	✓		
4.2 Techniques for solving integration: a) inspection	✓		
4.3 Techniques for solving integration: b) substitution	✓(might be a chance to catch this up in tutorials)		
4.4 Techniques for solving integration: c) partial fractions	✓(might be a chance to catch this up in tutorials)		

4.5 Techniques for solving integration: d) parts	√(might be a chance to catch this up in tutorials)		
Extension material: Applications of integration			√
<b>5. Differential equations</b>			
5.1 1 <sup>st</sup> order equations: separable		√	
5.2 1 <sup>st</sup> order equations: integrating factors		√	
5.3 2 <sup>nd</sup> order equations: homogeneous		√	
5.4 2 <sup>nd</sup> order equations: inhomogeneous			√
5.5 Linear vs non-linear differential equations			√
Extension material: Solving complicated linear differential equations			√
<b>6. Complex numbers</b>			
6.1 Complex numbers in general	√		
6.2 Complex arithmetic	√		
6.3 Argand diagram	√(might be a chance to catch this up in tutorials)		
6.4 rexp(iθ) form	√(might be a chance to catch this up in tutorials)		
6.5 De Moivre's theorem			√
Extension material: Applications of complex numbers			√
<b>7. Statistics</b>			
7.1 Standard definitions and different probability distributions			√
7.2 Fitting straight line data with the method of least squares			√

## Chemistry Bridging Programme

This course is not necessary for Materials Science students but there are some topics that could be useful and might be of interest to you.

## Physics Bridging Programme

This course is not necessary for Materials Science students but there are some topics that could be useful and might be of interest to you.

## Computing and Study Skills

All science degrees at Oxford will use computers for one or more of the above tasks, perhaps involving writing specific pieces of code, or by carrying out experiments with computers acquiring the data.

The computer packages used during your degree and suggested online courses to study before you arrive in Oxford are detailed below.

<b>Subject</b>	<b>Computer package(s) used during degree</b>	<b>Suggested online courses to study before arrival in Oxford</b>
Materials Science	Python, Matlab, LabView, Excel	All computer courses in the degree assume very little knowledge. Do the Matlab course only if you have time and are interested.

The study skills information is relevant to all students.