Guidelines for the use of the online bridging programme by Physics/Physics & Philosophy 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

All the topics covered in the Maths Bridging Programme are important for Physicists and it is assumed that all students will cover the topics that are categorised as 'essential' before the term starts.

Topic	Essential knowledge	Helpful if students know this	Not needed before students start
1. Basic geometry, trigonometry and misc. functions			
1.1 Basic geometry	✓		
1.2 Binomial expansion, Taylor/Maclaurin series, use in finding limits	✓		
1.3 Sums of geometric and arithmetic progressions	✓		
1.4 Sine, cosine, tangent	✓		
1.5 Important functions	✓		
Extension material: Proof by induction		✓	
2. Vectors and matrices			
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		✓	
3. Differentiation			
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	✓		
4. Integration			
4.1 Integration in general	✓		
4.2 Techniques for solving integration: a) inspection	✓		
4.3 Techniques for solving integration: b) substitution	✓		
4.4 Techniques for solving integration: c) partial fractions	✓		
4.5 Techniques for solving integration: d) parts	✓		
Extension material: Applications of integration		✓	
5. Differential equations			
5.1 1st order equations: separable	✓		
5.2 1st order equations: integrating factors	✓		
5.3 2nd order equations: homogeneous	✓		
5.4 2nd order equations: inhomogeneous		✓	
5.5 Linear vs non-linear differential equations		✓	

Extension material: Solving complicated linear differential equations		✓	
6. Complex numbers			
6.1 Complex numbers in general	✓		
6.2 Complex arithmetic	✓		
6.3 Argand diagram	✓		
6.4 rexp(i□) form		✓	
6.5 De Moivre's theorem		✓	
Extension material: Applications of complex numbers		✓	
7. Statistics			
7.1 Standard definitions and different probability distributions		✓	
7.2 Fitting straight line data with the method of least squares		✓	

Chemistry Bridging Programme

The topics marked 'essential' are the ones you should be familiar with before the commencement of your course. You may wish to look at the other topics for general information but they are not needed before the start of your course.

Topic	**Essential knowledge**	**Helpful if students know this**	**Not needed before students start**
1. Units and Dimensions			
1.1 SI unit system	✓		
1.2 Calculations with quantities	✓		
1.3 Dimensional analysis	✓		

2. Mole calculations			
2.1 Mole calculations			✓
2.2 Concentration and dilutions			✓
2.3 Gases			✓
2.4 Empirical formulae			✓
3. Atomic orbitals and the periodic table			
3.1 Atomic energy levels			✓
3.2 Atomic orbitals			✓
3.3 Periodicity of properties			✓
4. Chemical bonding			
4.1 A review of the basics			✓
4.2 Lewis structures for covalent bonding			✓
4.3 The shapes of molecules			✓
4.4 Molecular orbital theory			✓
4.5 Bond polarity			✓
4.6 Covalent or ionic bonding			✓
5. Chemical equilibrium			
5.1 Reaction rates and chemical equilibrium			✓
5.2 Equilibrium constant			✓
5.3 Acid-base equilibrium			✓
5.4 Equilibrium concentrations			✓

5.5 Standard Gibbs energy change and the equilibrium constant			✓
6. Organic compounds			
6.1 Organic molecules			✓
6.2 Isomerism			✓
6.3 Functional groups			✓
6.4 Introduction to organic reactions			✓
6.5 Electrophilic addition			✓
6.6 Electrophilic aromatic substitution			✓
6.7 Carbonyl chemistry			✓
6.8 Rates and reaction mechanisms			✓
7. Solid state chemistry			
7.1 Introduction			✓
7.2 Ionic solids as interpenetrating arrays			✓
7.3 Ionic solids by filling interstitial holes			✓

Physics Bridging Programme

All the topics covered in the Physics Bridging Programme are essential for Physicists and it is assumed that all students will cover all the topics listed below before the term starts. Physics and Philosophy students do not need to study the Circuit module.

Topic	**Essential knowledge**	**Helpful if students know this**	**Not needed before students start**
1. Mechanics			
1.1 Simple dynamics	✓		
1.2 Newton's laws and resolving vectors	✓		

1.3 Beyond SUVAT	✓		
1.4 1D collisions	✓		
1.5 Gravity and orbits	✓		
1.6 Simple harmonic motion	✓		
2. Data Handling and Statistics			
2.1 Data handling and statistics	✓		
2.2 Sampling from populations	✓		
2.3 Experimental errors	✓		
2.4 Propagating errors	✓		
2.5 Linear regression	✓		
3. Circuits			
3.1 The basics	✓		
3.2 Important laws	✓		
3.3 Circuits and resistors	✓		
3.4 Circuits with capacitors	✓		
3.5 Circuits with inductors	✓		
3.6 Real components	✓		

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.

Subject	Computer package(s) used during degree	Suggested online courses to study before arrival in Oxford
Physics	Python, Matlab, LabView	Matlab and Python

Physics and Philosophy	Python	None before the first year, Python before the start of the second year

The study skills information is relevant to all students.