

## Pathways through MMathPhys course

The following table details some examples of possible pathways through the Programme. These case studies are for illustrative purposes only and show the breadth and diversity of the programme. Many other paths through the course are possible — and in fact much more eclectic or more generalist selections of courses may be appropriate for students who have not settled on a specialisation they intend to pursue eventually.

Indispensable courses (“core”) for each given case study are indicated in bold. 1 unit=16 lectures; at least 10 units have to be taken over three terms. Note that some of the Case Studies below are sufficiently broad to allow multiple pathways within them.

<i>Pathway</i>	<i>MT</i>	<i>HT</i>	<i>TT</i>
<p>“<i>TEORICA UNIVERSALIS</i>” (Generalist Theoretical Physicist) <b>Core 4–5 units</b> Total 10–12 units</p>	<p><b>1. QFT 24</b> <b>2-4. Three of</b> <b>Intro. Quant. CMP 16</b> <b>Noneq. Stat. Phys. 8</b> <b>Kinetic Theory 24</b> <b>GR I 16</b> <b>Pert. Methods 16</b></p>	<p>1-3. <i>Three of</i> Advanced QFT 24 Quantum CMP II 24 Adv. Fluid Dyn. 16 Soft Matter 16 Nonlinear Systems 16 Plasma Physics 16 Cosmology 16</p>	<p>1-3. <i>Three of</i> Gauge-String Duality 16 Standard Model 16 Critical Phenomena 16 Turbulence 16 AFD 16 QFT in Curved Space 16</p>
<p>“<i>APPLICATA</i>” (Applied Mathematician) <b>Core 4–4.5 units</b> Total 10–10.5 units</p>	<p><b>1-2. Two of</b> <b>Noneq. Stat. Phys. 8</b> <b>Kinetic Theory 24</b> <b>Visc. Flow 16</b> <b>GR I 16</b> <b>3. Pert. Methods 16</b> 4. <i>One of</i> Sci. Comp. I 12 Num. Slns Diff. Eqns I 16 Num. Lin. Algebra 16</p>	<p><b>1. Adv. Fluid Dyn. 24</b> 2. <i>One of</i> Nonlinear Systems 16 Networks 16 Waves/Comp. Flow 16 Plasma Physics 16 Galactic Dyn. 16 GR II 16 <b>3. One of</b> <b>Complex Variables 16</b> <b>Diff. Geometry 16</b> 4. <i>One of</i> Sci. Comp. II 12 Num. Slns Diff. Eqns II 16</p>	<p>1-2. <i>Two of</i> Complex Systems 16 Turbulence 16 GFD 16 AFD 16 Dissertation</p>
<p>“<i>CONTINUA</i>” (Fluid Dynamicist) <b>Core 8.5-9 units</b> Total 10–10.5 units</p>	<p><b>1. Kinetic Theory 24</b> <b>2. Visc. Flow 16</b> <b>3. Pert. Methods 16</b> 4. <i>One of</i> <b>Sci. Comp. I 12</b> <b>Num. Slns Diff. Eqns I 16</b></p>	<p><b>1. Adv. Fluid Dyn. 24</b> <b>2. Waves/Comp. Flow 16</b> 3. <i>One of</i> Nonlinear Systems 16 Soft Matter Phys. 16 Plasma Physics 16 Complex Variables 16 <b>4. One of</b> <b>Sci. Comp. II 12</b> <b>Num. Slns Diff. Eqns II 16</b></p>	<p><b>1. Turbulence 16</b> 2. <i>One of</i> Topics Soft Matter 8 GFD 16 AFD 16 Dissertation</p>
<p>“<i>GEOMETRA</i>” (Mathematician with a physics streak) <b>Core 5.5 units</b> Total 10 units</p>	<p><b>1. QFT 24</b> <b>2. GR I 16</b> 3. <i>One of</i> Groups &amp; Repr. 24 Algebraic Topology 16 Algebraic Geometry 16</p>	<p><b>1. String Theory I 16</b> <b>2. Diff. Geometry 16</b> 3. <i>One of</i> Advanced QFT 24 SUSY &amp; SUGRA 24 GR II 16 Geom. Group Theory 16</p>	<p><b>1. String Theory II 16</b> 2. <i>Two of</i> CFT 16 Standard Model 16 Beyond the SM 16 QFT in Curved Space 16</p>

<p>“<i>PARTICULATA</i>” (Particle Phenomenologist) <b>Core 8 units</b> Total 10.5–11 units</p>	<p><b>1. QFT 24</b> <b>2. Groups &amp; Repr. 24</b> 3. <i>One of</i> Stat. Mech. 16 GR I 16 Pert. Methods 16 Sci. Comp. I 12 Num. Slns Diff. Eqs I 16</p>	<p><b>1. Advanced QFT 24</b> <b>2. SUSY &amp; SUGRA 24</b> 3. <i>One of</i> String Theory I 16 GR II 16 Cosmology 16 Sci. Comp. II 12 Num. Slns Diff. Eqs II 16</p>	<p><b>1. Standard Model 16</b> <b>2. Nonpert. QFT 16</b> 2. <i>One of</i> String Theory II 16 Beyond the SM 16 QFT in Curved Space 16 Astroparticle Phys. 16</p>
<p>“<i>SUPERCORDULA</i>” (Hard-core String Theorist) <b>Core 7.5 units</b> Total 10–10.5 units</p>	<p><b>1. QFT 24</b> <b>2. Groups &amp; Repr. 24</b> 3. <i>One of</i> Stat. Mech. 16 GR I 16 Pert. Methods 16 Sci. Comp. I 12 Num. Slns Diff. Eqs I 16 Algebraic Geometry 16</p>	<p><b>1. Advanced QFT 24</b> <b>2. String Theory I 16</b> 3. <i>One of</i> SUSY &amp; SUGRA 24 GR II 16 Cosmology 16 Sci. Comp. II 12 Num. Slns Diff. Eqs II 16 Diff. Geometry 16</p>	<p><b>1. String Theory II 16</b> <b>2. CFT 16</b> 3. <i>One of</i> Gauge-String Duality 16 Standard Model 16 Beyond the SM 16 QFT in Curved Space 16 Nonpert. QFT 16</p>
<p>“<i>CONDENSATA</i>” (Condensed Matter Theorist) <b>Core 7 units</b> Total 10.5–11.5 units</p>	<p><b>1. QFT 24</b> <b>2. Intro Quant. CMP 16</b> <b>3. Noneq. Stat. Phys. 8</b> <b>4. Sci. Comp. I 12</b></p>	<p><b>1. Quant. CMP II 24</b> <b>2. Soft Matter 16</b> 3. <i>One of</i> Advanced QFT 24 Adv. Fluid Dyn. 16 Nonlinear Systems 16 <b>4. Sci. Comp. II 12</b></p>	<p>1. Topics Quant. CMP 8 2. Topics Soft Matter 8 3. <i>Two of</i> Adv. Quant. CMP 8 Critical Phenomena 16 CFT 16</p>
<p>“<i>DURACELLA</i>” (Hard-core Hard Condensed Matter Theorist) <b>Core 6.5 units</b> Total 10–11.5 units</p>	<p><b>1. QFT 24</b> <b>2. Intro Quant. CMP 16</b> 3. <i>One of</i> Noneq. Stat. Phys. 8 Kinetic Theory 24 Pert. Methods 16 <b>4. Sci. Comp. I 12</b></p>	<p><b>1. Quant. CMP II 24</b> 2. <i>One of</i> Advanced QFT 24 String Theory I 16 Adv. Fluid Dyn. 16 <b>3. Sci. Comp. II 12</b></p>	<p><b>1. Adv. Quant. CMP 8</b> <b>2. Topics Quant. CMP 8</b> 3-4. <i>Two of</i> Critical Phenomena 16 CFT 16 Gauge-String Duality 16 Nonpert. QFT 16</p>
<p>“<i>MOLLIS</i>” (Soft Condensed Matter Physicist/Biophysicist) <b>Core 7 units</b> Total 11.5 units</p>	<p>1. QFT 24 <b>2. Noneq. Stat. Phys. 8</b> <b>3. Kinetic Theory 24</b> 4. Pert. Methods 16 <b>5. Sci. Comp. I 12</b></p>	<p><b>1. Adv. Fluid Dyn. 16</b> <b>2. Soft Matter 16</b> 3. <i>One of</i> Nonlinear Systems 16 Networks 16 <b>4. Sci. Comp. II 12</b></p>	<p><b>1. Topics Soft Matter 8</b> 2. Critical Phenomena 16 3. Complex Systems 16</p>
<p>“<i>COMPLICATA</i>” (Complexity Scientist) <b>Core 5–5.5 units</b> Total 10–11 units</p>	<p><b>1. Noneq. Stat. Phys. 8</b> 2. Kinetic Theory 24 3. Pert. Methods 16 4. <i>One of</i> <b>Sci. Comp. I 12</b> <b>Num. Slns Diff. Eqs I 16</b></p>	<p>1. Soft Matter 16 <b>2. Nonlinear Systems 16</b> <b>3. Networks 16</b> 4. <i>One of</i> <b>Sci. Comp. II 12</b> <b>Num. Slns D. Eqs II 16</b></p>	<p><b>1. Complex Systems 16</b> 2-3. <i>Two of</i> Topics Soft Matter 8 Critical Phenomena 16 Turbulence 16</p>
<p>“<i>ASTRA-STELLA</i>” (All-round Astrophysicist) <b>Core 6.5 units</b> Total 11–12 units</p>	<p><b>1. Kinetic Theory 24</b> <b>2. GR I 16</b> 3. <i>One of</i> QFT 24 Pert. Methods 16 4. <i>One of</i> Sci. Comp. I 12 Num. Slns Diff. Eqs I 16</p>	<p>1-2. <i>Two of</i> Galactic Dyn. 16 Stellar Astrophys. 16 Cosmology 16 3. <i>One of</i> Waves/Comp. Flow 16 Adv. Fluid Dyn. 16 Plasma Physics 16 4. <i>One of</i> Sci. Comp. II 12 Num. Slns Diff. Eqs II 16</p>	<p><b>1. AFD 16</b> <b>2. High-Energy Astro 16</b> 3. <i>One of</i> Turbulence 16 GFD 16 Astroparticle Phys. 16 QFT in Curved Space 16</p>

<p>“<i>COSMICOSMICA</i>” (Dedicated Cosmologist) <b>Core 4 units</b> Total 10–11 units</p>	<p><b>1. GR I 16</b> 2-3. <i>Two of</i> QFT 24 Kinetic Theory 24 Pert. Methods 16 4. <i>One of</i> Sci. Comp. I 12 Num. Slns Diff. Eqs I 16</p>	<p><b>1. Cosmology 16</b> <b>2. GR II 16</b> 3. <i>One of</i> Waves/Comp. Flow 16 Galactic Dyn. 16 Stellar Astrophys. 16 4. <i>One of</i> Sci. Comp. II 12 Num. Slns Diff. Eqs II 16</p>	<p>1. <i>One of</i> AFD 16 High-Energy Astro 16 QFT in Curved Space 16 <b>2. Astroparticle Phys. 16</b></p>
<p>“<i>GAIA</i>” (Geophysicist/ Climate Physicist) <b>Core 4.5–5 units</b> Total 10–10.5 units</p>	<p>1-2. <i>Two of</i> Kinetic Theory 24 Viscous Flow 16 Noneq. Stat. Phys. 8 <b>3. Pert. Methods 16</b> 4. <i>One of</i> <b>Sci. Comp. I 12</b> <b>Num. Slns Diff. Eqs I 16</b></p>	<p><b>1. Nonlinear Systems 16</b> 2. <i>One of</i> Networks 16 Waves/Comp. Flow 16 <b>3. One of</b> <b>Sci. Comp. II 12</b> <b>Num. Slns D. Eqs II 16</b></p>	<p><b>1. GFD 16</b> 2. Turbulence 16 3. Complex Systems 16</p>
<p>“<i>PLASMA</i>” (Plasma Theorist) <b>Core 7–7.5 units</b> Total 10.5-11 units</p>	<p><b>1. Kinetic Theory 24</b> 2. Noneq. Stat. Phys. 8 <b>3. Pert. Methods 16</b> 4. <i>One of</i> <b>Sci. Comp. I 12</b> <b>Num. Slns Diff. Eqs I 16</b></p>	<p><b>1. Adv. Fluid Dyn. 16</b> <b>2. Plasma Physics 16</b> 3. <i>One of</i> Nonlinear Systems 16 Stellar Astrophys. 16 Complex Variables 16 4. <i>One of</i> <b>Sci. Comp. II 12</b> <b>Num. Slns D. Eqs II 16</b></p>	<p><b>1. Adv. Plasma Phys. 16</b> 2. AFD 16 3. Turbulence 16</p>