<table>
<thead>
<tr>
<th>Module Code</th>
<th>PYU11E04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module Name</td>
<td>Physics</td>
</tr>
<tr>
<td>ECTS Weighting</td>
<td>5 ECTS</td>
</tr>
<tr>
<td>Semester taught</td>
<td>Semester 2</td>
</tr>
<tr>
<td>Module Coordinator/s</td>
<td>Prof Stefan Hutzler</td>
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</tbody>
</table>

**Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline**

- **LO1.** To introduce the student to the basic physical laws describing thermodynamic processes, heat and heat-transfer, oscillations and waves (including light and sound), electricity and magnetism
- **LO2.** To demonstrate the application of these laws and enable the student to apply them to basic, technologically relevant examples
- **LO3.** To introduce the student to measurement principles and their application to investigate physical phenomena
- **LO4.** To establish good laboratory practice and precise written reporting procedures

**Graduate Attributes: levels of attainment**

- To act responsibly - Introduced
- To think independently - Introduced
- To develop continuously - Introduced
- To communicate effectively - Introduced

**Module Content**

**Oscillations and Waves**

- Oscillator equation of motion, simple harmonic oscillator, damping, properties of waves, wave-equation, travelling and stationary waves, superposition-principle, Huygens principle, diffraction, interference, and polarisation, electromagnetic and sound waves.
<table>
<thead>
<tr>
<th><strong>Teaching and Learning Methods</strong></th>
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</thead>
</table>

- The module is taught using a combination of lectures, laboratories and tutorials. Most module materials (notes, tutorials) are provided in electronic form. Students work in tutorial and laboratory groups, thereby encouraging teamwork and cooperation whereas the research reports and homework are individual.

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**Geometric Optics**

- Mirrors, lenses and prisms, reflection, refraction, polarisation, interference/diffraction, image formation, simple optical systems.

**Thermal Physics**

- Temperature (including kinetic gas theory), temperature scales, thermometers, thermal expansion, laws of thermodynamics, ideal and real gases, isochoric and isobaric heat capacity, thermodynamic cycles (including clockwise and anti-clockwise Carnot cycle); heat transfer, conduction, convection, radiation.

**Electricity and Magnetism**

- Introduction to electrostatics, magnetostatics and electromagnetism: electric charge, Coulomb's law, concepts of electrical field and potential, energy, Biot-Savart Law, Ampere's Law, magnetic fields, Lorenz Force, Electromagnetic induction and Faraday's Law, summary of Maxwell equations.
### Assessment Details

Please include the following:

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

<table>
<thead>
<tr>
<th>Assessment Component</th>
<th>Assessment Description</th>
<th>LO Addressed</th>
<th>% of total</th>
<th>Week due</th>
</tr>
</thead>
<tbody>
<tr>
<td>End of semester exam</td>
<td>exam</td>
<td>1,2</td>
<td>60%</td>
<td>End of semester</td>
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<tr>
<td>Laboratory experiments and write-ups</td>
<td>Marking of write-ups</td>
<td>3,4</td>
<td>40%</td>
<td>Every other week</td>
</tr>
<tr>
<td>tutorials</td>
<td>unmarked</td>
<td>2</td>
<td>0</td>
<td>Every week</td>
</tr>
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### Reassessment Requirements

Exam only

### Contact Hours and Indicative Student Workload

**Contact hours:** 52

**Independent Study (preparation for course and review of materials):**

**Independent Study (preparation for assessment, incl. completion of assessment):**

### Recommended Reading List

University Physics, Young and Freedman, 12th edition

### Module Pre-requisite

none

### Module Co-requisite

none

### Module Website

[https://www.tcd.ie/Engineering/undergraduate/baiyear1/modules/1E4.pdf](https://www.tcd.ie/Engineering/undergraduate/baiyear1/modules/1E4.pdf)

### Are other Schools/Departments involved in the delivery

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3 TEP Guidelines on Workload and Assessment
<table>
<thead>
<tr>
<th><strong>Module Approval Date</strong></th>
<th><strong>Approved by</strong></th>
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<tbody>
<tr>
<td><strong>Academic Start Year</strong></td>
<td>September 27&lt;sup&gt;th&lt;/sup&gt; 2021</td>
</tr>
<tr>
<td><strong>Academic Year of Date</strong></td>
<td>2021/2022</td>
</tr>
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