<table>
<thead>
<tr>
<th>Module Code</th>
<th>PYU11E04</th>
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<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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**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 oscillations and waves (including light and sound), thermodynamic processes, heat and heat-transfer, 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 clearly written laboratory reports

**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**

- Simple harmonic oscillator (+resonance and damping), properties of waves, wave-equation, travelling and stationary waves, superposition-principle, Huygens principle, diffraction, interference, and polarisation, electromagnetic and sound waves. (Applications of electromagnetic waves in different frequency ranges). Sound waves, decibel scale.

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1 **TEP Glossary**
Geometrical 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, Carnot cycle; heat transfer, conduction, convection, radiation. (Fridges, heat pumps, combustion engines)

Electricity and Magnetism

- Introduction to electrostatics, magnetostatics and electromagnetism: electric charge, Coulomb's law, electric currents, Ohm’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.

Teaching and Learning Methods

The module is taught using a combination of lectures, laboratories and tutorials. Most module materials (lecture notes, tutorials) are provided in electronic form. Students work in tutorial and laboratory groups, thereby encouraging teamwork and cooperation. Laboratory reports are individual.
### 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>
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<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>
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<tr>
<td>tutorials</td>
<td>unmarked</td>
<td>2</td>
<td>0</td>
<td>Every week</td>
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### Reassessment Requirements

Exam only

### Contact Hours and Indicative Student Workload

**Contact hours:** 54

- Independent Study (preparation for course and review of materials):
- Independent Study (preparation for assessment, incl. completion of assessment):

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**Recommended Reading List**

University Physics, Young and Freedman, 12th edition

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**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)

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2. [TEP Guidelines on Workload and Assessment](#)
of this module? If yes, please provide details.

<table>
<thead>
<tr>
<th>Module Approval Date</th>
<th>Approved by</th>
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<tbody>
<tr>
<td>Academic Start Year</td>
<td>September 2022</td>
</tr>
<tr>
<td>Academic Year of Date</td>
<td>2022/2023</td>
</tr>
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