1. **Title of the module**

PHYS3220 (PH322) - Electricity and Light

1. **School or partner institution which will be responsible for management of the module**

Physical Sciences

1. **The level of the module (Level 4, Level 5, Level 6 or Level 7)**

Level 4

1. **The number of credits and the ECTS value which the module represents**

15 credits (7.5 ECTS)

1. **Which term(s) the module is to be taught in (or other teaching pattern)**

Spring

1. **Prerequisite and co-requisite modules**

UK A Level Physics Examinations with a normal minimum attainment of a Grade C on the main Physics A Level. Any generally accepted equivalent of this content and attainment is regarded as an acceptable prerequisite.

Co-requisites:

PHYS3110 Mathematics I

PHYS3120 Mathematics II

PHYS3040 Astrophysics, Space Science and Cosmology

PHYS3210 Mechanics

PHYS3230 Thermodynamics and Matter

PHYS3700 Laboratory and Computing Skills for Physicists

1. **The programmes of study to which the module contributes**

BSc/BSc with Foundation Year/BSc with Year in Industry/MPhys/MPhys with Year Abroad Physics

BSc/MPhys/MPhys with Year Abroad Physics with Astrophysics

BSc/MPhys/MPhys with Year Abroad Astronomy, Space Science and Astrophysics

This is not available as a wild module.

1. **The intended subject specific learning outcomes.  
   On successfully completing the module students will be able to:**

Have:

8.1 Knowledge and understanding of laws and principles of electricity and light, and their application to diverse areas of physics. (A1)

8.2 An ability to identify relevant principles and laws of electricity and light when dealing with problems, and to make approximations necessary to obtain solutions. (B1)

8.3 An ability to solve problems involving electricity and light using appropriate mathematical tools. (B2)

8.4 An ability to use mathematical techniques and analysis to model physical behaviour involving electricity and light. (B4)

8.5 An ability to present and interpret information relating to electricity and light graphically. (C2)

8.6 An ability to make use of appropriate texts, research-based materials or other learning resources about electricity and light as part of managing their own learning. (C6)

1. **The intended generic learning outcomes.  
   On successfully completing the module students will be able to:**

Have a knowledge and understanding of:

9.1 Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area. (D1)

9.2 Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly. (D4)

1. **A synopsis of the curriculum**

Properties of Light and Optical Images; Wave nature of light. Reflection, refraction, Snell’s law, total internal reflection, refractive index and dispersion, polarisation. Huygens' principle, geometrical optics including reflection at plane and spherical surfaces, refraction at thin lenses, image formation, ray diagrams, calculation of linear and angular magnification, magnifying glass, telescopes and the microscope.

Electric Field; Discrete charge distributions, charge, conductors, insulators, Coulomb’s law, electric field, electric fields lines, action of electric field on charges, electric field due to a continuous charge distribution, electric potential, computing the electric field from the potential, calculation of potential for continuous charge distribution.

Magnetic Field; Force on a point charge in a magnetic field, motion of a point charge in a magnetic field, mass spectrometer and cyclotron.

Electric current and Direct current circuits, electric current, resistivity, resistance and Ohm’s Law, electromotive force, ideal voltage and current sources, energy and power in electric circuits, theory of metallic conduction, resistors in series and in parallel, Kirchhoff’s rules and their application to mesh analysis, electrical measuring instruments for potential difference and current, potential divider and Wheatstone’s bridge circuits, power transfer theorem, transient current analysis in RC, RL, LC and LRC circuits using differential equations.

Alternating Current Circuits; Phasor and complex number notation introduced for alternating current circuit analysis, reactance and complex impedance for Capacitance and Inductance, application to LRC series and parallel circuits. Series and parallel resonance, AC potential dividers and filter circuits, Thevenin's theorem, AC bridge circuits to measure inductance and capacitance, mutual inductance, the transformer and its simple applications.

1. **Reading list (Indicative list, current at time of publication. Reading lists will be published annually)**

Core:

* Physics for Scientists and Engineers (6th Ed.); Tipler, P.A. & Mosca, G. (2008)

Background:

* Schaum's outline of theory and problems of electric circuits; Nahvi, M. & Edminister, J. (2003)

1. **Learning and teaching methods**

Total contact hours: 30

Private study hours: 120

Total study hours: 150

1. **Assessment methods**
   1. Main assessment methods

Assignment 1 (5 hours, 3.33%)

Assignment 2 (5 hours, 3.33%)

Assignment 3 (5 hours, 3.33%)

Assignment 4 (5 hours, 3.33%)

Assignment 5 (5 hours, 3.33%)

Assignment 6 (5 hours, 3.33%)

Examination (2 hours, 80%)

13.2 Reassessment methods

Like-for-like

1. **Map of module learning outcomes (sections 8 & 9) to learning and teaching methods (section12) and methods of assessment (section 13)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Module learning outcome** | *8.1* | *8.2* | *8.3* | *8.4* | *8.5* | *8.6* | *9.1* | *9.2* | *9.3* | *9.4* |  |  |
| **Learning/ teaching method** |  |  |  |  |  |  |  |  |  |  |  |  |
| Lectures | **X** | **X** | **X** | **X** | **X** |  | **x** | **x** |  |  |  |  |
| Workshops | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |  |  |  |  |
| Self-studies | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |  |  |  |  |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |  |  |
| Assignments | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  |  |  |  |
| Final exam | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |  |  |  |  |

1. **Inclusive module design**

The School recognises and has embedded the expectations of current equality legislation, by ensuring that the module is as accessible as possible by design. Additional alternative arrangements for students with Inclusive Learning Plans (ILPs)/declared disabilities will be made on an individual basis, in consultation with the relevant policies and support services.

The inclusive practices in the guidance (see Annex B Appendix A) have been considered in order to support all students in the following areas:

a) Accessible resources and curriculum

b) Learning, teaching and assessment methods

1. **Campus(es) or centre(s) where module will be delivered**

Canterbury

1. **Internationalisation**

Physics is an international subject with physical laws discovered and techniques developed and refined by Physicists across the globe. Mastery of the subject-specific learning outcomes, will equip students to apply the theories and techniques of this module in a wide range of international contexts. The module team is drawn from the School of Physical Sciences, which includes many members of staff with international experience of teaching and research collaboration. In compiling the reading list, consideration has been given to the range of texts that are available internationally and a selection of texts has been identified to complement the delivery of the material. The support SPS provides to its students is also internationally attuned given our international student body.

**FACULTIES SUPPORT OFFICE USE ONLY**

**Revision record – all revisions must be recorded in the grid and full details of the change retained in the appropriate committee records.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of the delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
| 10/07/2019 | Minor | September 2019 | 6, 13, 14 |  |
|  |  |  |  |  |