### COURSE DETAILS

- **Course Code:** B28TP
- **Full Course Title:** Thermal Physics and Properties of Matter
- **SCQF Level:** 8
- **SCAF Credits:** 15
- **Available as Elective:** No

### DELIVERY LEVEL

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### COURSE AIMS

- To introduce and develop the topics of thermal physics and the properties of matter.
- To provide the mathematical techniques for analysing and solving problems in these topics.

### LEARNING OUTCOMES – SUBJECT MASTERY

On completion of this course, the learner will be able to:

- Achieve a critical knowledge and understanding of the properties of matter and thermodynamics
- Demonstrate a detailed knowledge and understanding of the course topics
- Integrate previous knowledge from the physics programme with the topics discussed in the course
- Apply the theory of the course topics to problems or situations not previously encountered

### LEARNING OUTCOMES – PERSONAL ABILITIES

Personal abilities are embedded in the course. The course provides the opportunity to:

- Apply the advanced core knowledge expected of a professional physicist to gain professional level insights,
- Communicate effectively with professional level colleagues
- Interpret, use and evaluate critically a wide range of data to solve problems of both a familiar and unfamiliar nature
- Manage time effectively, work to deadlines and prioritise workloads
- Use a range of ICT skills with on-line materials and web links to support the learning process
## B28TP Thermal Physics and Properties of Matter

Apply strategies for appropriate selection of relevant information from a wide source and large body of knowledge

Exercise significant initiative and independence in carrying out learning activities and researching information

<table>
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<th>SYLLABUS</th>
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### Concept of heat and temperature

Heat capacities, equipartition of energy, heat transport (conduction, convection and radiation), measurement of temperature and definition of temperature scales, black-body radiation

### The laws of thermodynamics

Zeroth Law; First law of thermodynamics (concepts of work and internal energy); Second law of thermodynamics (entropy, arrow of time). Free energies.

### Physics of the atmosphere

Phase diagram of water, composition of the atmosphere, pressure gradients (vertical and horizontal), radiation balance and the physics of global warming

### Generation of energy

Carnot cycle, thermodynamic efficiency of turbines and car engines, efficiency of heat pumps and refrigerators, exploitation of nuclear fission and fusion for electricity generation

### Properties of matter
The three phases (gases, liquids, solids) and phase diagrams, kinetic theory of gases, dynamics of fluids including Bernolli’s equation and viscosity; Gas Laws up to Van der Waal’s eqn; Maxwell-Boltzmann distribution & Fermi-Dirac distribution.

Mechanical properties of matter: elasticity and thermal expansion.

**LOCATION AND ASSESSMENT METHODS**

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