SUBJECT: PHYSICS

AWARD RECEIVED: ADVANCED HIGHER

ENTRY LEVEL
Students will normally have Higher Physics, preferably at A or B.

COURSE CONTENT
The Course is split up into 4 Units, with the Key Areas covered in each outlined below:

Unit 1 - Rotational Motion and Astrophysics
This Unit covers the Key Areas of:
Kinematic relationships
♦ Calculus methods with the kinematic relationships for straight line motion with a constant acceleration
♦ Gradient represents instantaneous rate of change for displacement-time and velocity-time graphs
♦ Area under a graph, between limits, obtained by integration
Angular motion
♦ Angular displacement, velocity and acceleration
♦ Centripetal force and acceleration
Rotational dynamics
♦ Torque, moment of inertia and angular acceleration
♦ Conservation of angular momentum
♦ Rotational kinetic energy
Gravitation
♦ Gravitational field strength
♦ Universal law of gravitation
♦ Gravitational potential and potential energy
♦ Escape velocity
General relativity
♦ Equivalence principle and its consequences
♦ Spacetime diagrams
♦ Black holes
Stellar physics
♦ Properties of stars
♦ Hydrogen and helium fusion reactions — production of deuterium, helium 3, helium 4, positrons, neutrinos and gamma rays
♦ Stellar evolution
♦ The Hertzsprung-Russell (H-R) diagram

Unit 2 - Quanta and Waves
This Unit covers the Key Areas of:
Introduction to quantum theory
♦ Challenges to classical theory
♦ Black body radiation
♦ Photoelectric effect
♦ Bohr model of the atom
♦ Wave particle duality
♦ De Broglie waves
♦ Uncertainty principle
Particles from space
♦ Cosmic rays
♦ Solar wind
Simple harmonic motion
♦ Dynamics of simple harmonic motion (SHM)
♦ Angular frequency and period
♦ Solutions of the SHM equation
♦ Kinetic and potential energy in SHM

Waves
♦ Energy transferred by a wave is directly proportional to the square of the amplitude
♦ Mathematical representation of travelling waves
♦ Phase difference and phase angle
♦ Superposition of waves
♦ Stationary waves
Interference
♦ Conditions for constructive and destructive interference
♦ Coherence
♦ Division of amplitude
♦ Optical path length, geometrical path length, phase difference and optical path difference
♦ Thin film interference
♦ Wedge fringes
♦ Division of wavelength
♦ Young's slits interference
Polarisation
♦ Plane polarisation of transverse waves
♦ Brewster's angle

Unit 3 - Electromagnetism
This Unit covers the Key Areas of:
Fields
♦ Electric field strength
♦ Coulomb's Inverse Square Law
♦ Electrical potential and electric field strength around a point charge and a system of charges
♦ Potential difference and electric field strength for a uniform electric field
♦ Motion of charged particles in uniform electric fields
♦ The electronvolt as a unit of energy
♦ Ferromagnetism
♦ Magnetic field patterns
♦ Magnetic induction
♦ Magnetic induction at a distance from a long current carrying wire
♦ force on a current carrying conductor in a magnetic field
♦ Compare gravitational, electrostatic, magnetic and nuclear forces
Circuits
♦ Capacitors in d.c. circuits
♦ The time constant for a CR circuit
♦ Capacitors in a.c. circuits
♦ Capacitive reactance
♦ Inductors in d.c.circuits
♦ Self-inductance of a coil
♦ Lenz's Law
♦ Energy stored by an inductor
♦ Inductors in a.c.circuits
♦ Inductive reactance
Electromagnetic radiation
♦ The unification of electricity and magnetism
♦ Electromagnetic radiation (EMR)exhibits wave properties
♦ Electric and magnetic field components of EMR
♦ Relationship between the speed of light and the permittivity and permeability of free space

Unit 4 - Investigating Physics
In this Unit, learners will develop key investigative skills. The Unit offers opportunities for independent learning set within the context of experimental Physics. Learners will identify, research, plan and carry out a Physics investigation of their choice.

Project…

Project
As part of their Advanced Higher Physics Course, students need to carry out a practical Investigation/Project. This could be on any related topic they choose, or it could be on a theme suggested by their teacher. Students will be supported through their Project, but they will also be expected to make progress independently for some of the time. They need to keep a 'log-book' of their on-going work and then produce a Report of their Investigation. The 'log-book' gets checked and marked internally by their teacher and the Report is externally marked by the SQA, which then counts towards their final, overall Grade, along with their Exam score.

ASSESSMENT
To gain an overall Award for this Course, students need to pass the:
- **Unit Assessments** for each of the Units – these are marked internally in school;
- **Course Assessment**, which is marked by the SQA and includes an**:**
    1. **Project** (30 marks)
    2. **Exam** (100 marks)

The Course assessment is graded A–D. The grade is determined on the basis of the total mark for all Course assessments together.

HOMEWORK
Homework is an essential part of the course. It helps prepare students for unit tests, prelim and final examinations. Homework will take the form of: write up of course lab work; extended answer questions; data handling questions; practise problems; regular revision of all the material covered in the course and preparation of the Investigation Report.

TRANSFERABLE SKILLS
There are many very useful and valuable transferable skills gained by studying Advanced Higher Physics, including: researching, ICT, reporting, numeracy, literacy, graphing, investigating, practical experimental skills, analysing, presentation, evaluating, to name a few.

PROGRESSION
There is good progression from this Course on to further study at University as well as providing an excellent advantage to those seeking employment in a wide range of professions.