Institute of Physics

Why choose *Advancing Physics?*

Basic physics ideas and methods, with connections to everyday life and to people and society. It gives you choices and points you to future careers using physics.

Advancing Physics
Advancing achievement

Year 1 Advanced Subsidiary Course

modular written exams 70% and coursework 30%

Communications

1 Imaging
Digital imaging, in medicine, astronomy, seeing inside matter. Eyes, lenses and human perception.

2 Sensing
Electronic sensors and instrumentation; understanding electric circuits, current, potential difference, power.

3 Signalling
Digital communications: fax, telephone, e-mail, television. Waves carrying information.

Designer materials

4 Materials on test
Selecting natural and human-made materials for a job: metals, ceramics, glasses, polymers, fibres, wood. How they behave and what they can do.

5 Looking inside materials
Explaining how materials behave: cracking, slipping, stretching, conducting electricity.

Wave & quantum behaviour

6 Wave behaviour
Waves on top of one another. Colours and sounds from waves combining. Trying to understand the true nature of light – a story from history. Interference and diffraction.

7 Quantum behaviour
The story of light brought up to date: quantum behaviour of photons. What is quantum behaviour? And finding that electrons do it too.

Space and time

8 Mapping space and time
Mapping space: what vectors are and how they add together. Journeys: speed, time, velocity. Graphing journeys, finding distances and velocities.

9 Computing the next move
Air traffic control, relative velocity. Athletics, cars, aeroplanes: how accelerations work. Sky diving and tennis: falling under gravity. High speed trains: kinetic energy, potential energy.

Coursework

Instrumentation project
Make and test a sensor, or check out a commercial sensor, or use sensors in an experiment.

Materials presentation
Research into a material of your own choice, and make a presentation about it.

Data analysis project
Analyse and report on data you collected or which you are given.

Year 2 Advanced Level Course

modular written exams 70% and coursework 30%

Models and rules

10 Creating models
How to build simple computer models: exponential decay, harmonic oscillator, potential and kinetic energy

11 Out into space
Leaving Earth behind: the story of our exploration of the planets. Circular motion, gravitational field, gravitational potential, momentum.

12 Our place in the Universe
Reasons for supposing that we live in an expanding Universe. Measuring the Universe. Where relativity comes from.

Matter in extremes

13 Matter: very simple
Predictions from simple chaos inside matter: kinetic theory of gases, thermal capacity, energy kT, conservation of energy

14 Matter: very hot and cold
Temperatures from absolute zero to millions of degrees. Liquid nitrogen, plasmas, biological materals. Pure random behaviour gives predictions, Boltzmann factor

Fields

15 Electromagnetic machines
How electromagnetic machines work and deliver power: transformer, dynamo, motors. Motive power present and future.

16 Charge and field
Accelerators: charges moving in electric and magnetic fields. Comparing electric and gravitational fields. Electric potential.

Fundamental particles of matter

17 Probing deep into matter
How to see inside atoms and the nucleus. Fundamental particles: steps to particle physics. Energy levels: models of atom using quantum ideas.

18 Ionising radiation and risk
Uses and risks of ionising radiation: radioactive decay, tracers in medicine, nuclear stability, $E = mc^2$

Advances in physics

19 Advances in physics
Case studies in physics, fundamental and applied. How ideas from physics work together

Coursework

Practical Investigation
Follow up a problem of your own choice.

Research Repor t
Research into and report on a topic of your own choice.

Advancing Physics
Advancing achievement

Advancing Physics offers you:

- Up to date physics: modern ideas and applications, important trends
- Help with mathematics: how to do the mathematics, and what it means
- Variety: something for everyone; fundamentals, applications, connections
- Involvement: you choose things to study in depth
- People and ideas: stories about where ideas came from and where they are going
- Real practical work: learning skills, investigating for yourself
- Using computers: tools, models, information
- Physics at work: medical and other applications, jobs physics can lead to

Supporting your study / Managing your learning

Students' Book with

- Physics told as an interesting human story
- Essential ideas presented as picture panels
- Attractive and informative visual illustrations
- Questions and answers to build confidence
- Summary 'What you have learned' checklists

CD-ROM with

- A-Z of physics: fingertip revision
- Activities and questions to do
- Images to look at, things to read
- Modern computer tools to use, data to work with
- Checklists: what can you do?

Institute of Physics PUBLISHING