Cuts to coursework and a rejig to fit Jan exam mooted for course content

As Jon Ogborn writes on p1, there are parts of *Advancing Physics* that need a rethink. The evaluation exercise that was carried out about three years ago revealed a few problems. In the centres that enter students for exams in January, teachers found that:

- At AS the need to cover the section C questions about materials and sensing – for which students need to have done those two elements of the coursework – mean that chapters 1–5 plus two coursework elements must be done by January. This is a tight schedule in the first term of AS study.
- At A2 the link between the practical investigation and the rise and fall of the clockwork universe means that centres using the January exam are forced to schedule the investigation earlier than they might wish. Those who prefer to do the research report in the first term of A2, rather than in the second term, must either do both A2 units in the summer or do the tests in reverse order, which creates problems in the way that the course is taught.

There are also concerns about the coursework elements:

- Plagiarism can undermine the integrity of the A2 research report.
- There is widespread concern about the amount of coursework. Different centres like (and dislike) different aspects of it, but it is clear that there is just too much of it and that the paperwork involved can be excessive.

According to QCA subject criteria published in September 2006 (http://www.qca.org.uk/downloads/qca-06-2864_science.pdf), coursework is not optional: all science specifications at A-level must have some internal assessment of practical work and communication. This should not be combined with written exams in one assessment unit as is currently done in A2; it must be in a separate unit as in the current AS structure.

To cope with these different demands, both from teachers and from the QCA, the following changes have been proposed:

- The present section C parts of the AS written papers will be dropped. These sections, which were valuable when the course began, have become rather routine and no longer earn their keep.
- The coursework in AS will be reduced to two items from three, and the weighting will be reduced from 30% to 20% of the AS total. One element will be practical, broadening the instrumentation project to deal with measurement (see p1). This will take two-thirds of the coursework marks. The materials presentation, "Physics in use", might be extended to include images and other aspects of the AS course, and it will account for one-third of the marks for unit 3.
- At A2 the investigation will remain unchanged, but the extent of the research report will be cut and its weighting reduced to 50%. The focus will be not on producing a freestanding article but on making a brief summary of the material. This summary must then be presented to the class or to the teacher and the student will undergo questioning to reveal the understanding that has been gained. This is very much in line with what is actually done in physics research groups: members of the group research and keep up to date with different aspects of the study and then brief colleagues on their findings.
- To make a January exam more feasible, the first unit in both AS and A2 will be shorter, concentrating only on the course content of the chapters concerned. The June written exam will be longer, adding an extra prerelease component. For A2 this will be similar to Section A of the present synoptic "Advances in physics" paper. For AS a similar extra section will be added to the current "Understanding processes" paper, which will test experimentation and data handling developed throughout AS in a synoptic way.
- In both AS and A2 the extra section in the June exam will be based on material that is made available in advance, just like the current advance notice article.
- The advance notice material in AS and A2 will incorporate the "How science works" aspects. For AS, the measurement strand will be the major part of this. For A2, the current advance notice article will provide a good model (this is also explored on p1).

To summarise, the assessment model that we are proposing is as depicted in the two tables above. At both AS and A2 it is planned that the practical coursework elements will be marked not out of 40 but out of 20, and that the smaller research-based element will be marked out of 10. The intention is to make marking more reliable and less onerous.

It should be noted that these proposals have not been finalised, nor submitted to the OCR or to the QCA for approval – they simply indicate our current thinking.

John Miller, *Advancing Physics* specification development team leader

AS-level assessment model

Unit		Time (min)	UMS	Mode	Weight (%) AS	GCE
1	physics in action	60	90	written	30	15
2	understanding processes; experimentation and data handling	105	150	written with advance notice component	50	25
3	physics in practice: –quality of measurement –presentation: physics in use		60	centre-based assessment	20	10

A2-level assessment model

Unit		Time (min)	UMS	Mode	Weight (%) A2	GCE
1	rise and fall of the clockwork universe	75	90	written	30	15
2	field and particle pictures; advances in physics	120	150	written with advance notice component	50	25
3	researching physics: –practical investigation –research briefing		60	centre-based assessment	20	10

New weightings for coursework at AS and A2 and shorter first units will be the main thrust of changes.

Structure of books, website and CD-ROMs is also to be refreshed

The planned revision of the *Advancing Physics* content and structure has given us the opportunity to revisit and develop the resources that support the course and to make improvements where possible and appropriate. Jon Ogborn has addressed the content changes, so this article outlines the proposed structural changes to the textbooks, the CDs and the *Advancing Physics* website.

The evaluation that was carried out in 2003 broadly identified the areas of satisfaction and dissatisfaction that our users felt with the current resource set. We have used this survey as the basis for a more in-depth study of how the books and CDs are (and are not, in some cases) used *in situ*. This research has resulted in us making a number of suggestions for resources in 2008, and these are briefly described below.

There was a very high level of satisfaction with the textbooks, so in style and feel these will remain broadly the same. We shall focus on the incorporation of new content and on necessary error corrections throughout AS and A2. The layout of the books will change with the aim of making them easier to read – a clear area for improvement that was identified by the evaluation.

It is the CDs that will change most significantly in structure, although it is important to say at this early stage that there will still be a CD resource available for both students and teachers.

The first and most obvious change is that the *Advancing Physics* Quick Tour will now be available at start-up on all of the CDs. Our research tells us that, once users see this invaluable tool, their use of the CD – and also of the associated resources – increases dramatically.

We are proposing to offer just one CD for teachers, which will combine both the AS and the A2 course resources, and network and standalone versions, and to allow unlimited users. There are currently no centres that teach only the AS or the A2 courses, so to combine the resources greatly reduces the amount of installation work that you have to do in the centres and means that we can offer this CD at a much more reasonable cost. It also makes sense to have all of the resources in just the one place. The student CDs will, necessarily, still be divided into AS and A2, with network and standalone versions.

We are reviewing the technology that we use for the CDs (including the third-party software that we include) to find the best fit for the job. Folio Views has been – and continues to be – very robust software and any review needs to take into account a large number of factors – network environments, operating systems, home users, school users, laptop installs, etc. There are also features – such as annotation – that are essential for some centres.

It is clear as well from the evaluation, and from our subsequent research, that an interface that is more intuitive to use – and that is familiar to student users in particular – is desirable. We are working with this in mind.

There will be a lot more consultation on this issue in the future for which your opinions will be of the greatest importance (see the final paragraph of this article).

Finally, along with the development of the current resources, there will be a long-overdue development of the *Advancing Physics* website. When the resources were created in 1999 (in fact, planning of them started in 1998), the technological landscape was very different. It was felt that resources that were essential to the course could not be placed on the website because to do this would have restricted access for some users.

This is not the case now, so it is proposed that some of the resources that are now on the CD and liable to change will be moved to the website, including the specification and some coursework guidance. In this way we can offer a far more up-to-date and reactive resource. The current web-base resource (which is well used, especially by students and teachers new to the course) will also be available, but in a format that is more accessible.

Our aim is to provide a user-friendly, interactive website that enhances the experience of *Advancing Physics* for students and for teachers, and that is – most important – an invaluable teaching and learning resource.

This is an exciting time for *Advancing Physics* and, now that the content changes have been outlined, we have the opportunity to build resources that are even more useful and intuitive for you and for your students. This is a process that we will be consulting on widely with everyone who uses our resources. Your feedback is invaluable in this, so we would encourage you to attend one of the consultation meetings that we are organising if at all possible (see box). Alternatively, you can send your feedback directly to me (e-mail: kerry.hopkins@iop.org).

Kerry Hopkins, *Advancing Physics* project manager

Consultation meetings spring 2007

We are aiming to consult as many of you as possible about changes to the content, structure and resources for *Advancing Physics* – your feedback is invaluable for building a better course and for ensuring that the changes are right for you.

We would like to invite you to a series of consultation meetings, where you will have the opportunity to hear more about, and to discuss, the changes with the project director, project manager and technical team (demonstration versions of the new resources will be on hand), and with the examining and assessment team. Dates and venues are as follows:

- **Monday 5 February**
  Discovery City Learning Centre, Liverpool
- **Tuesday 6 February**
  The Institute of Physics Publishing, Dirac House, Bristol
- **Wednesday 7 February**
  University of Birmingham, Birmingham
- **Thursday 8 February**
  The Institute of Physics, Portland Place, London

For more detail and to confirm your attendance, please contact Evie Palmer (e-mail: evie.palmer@iop.org) stating your preferred venue. We very much look forward to being able to welcome you to one of the meetings.

Contact

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Printed by Cambrian Printers, Aberystwyth, UK.

Give us your opinion on the changes

As part of the new *Advancing Physics* project we would appreciate a few moments of your time to complete the following questionnaire. Your views will guide us in developing the course to suit your and your students' needs. If you have any comments – good or bad – please tell us. Aternatively you can go to http://advancingphysics.iop.org/questionnaire to complete an online version. All entries will be entered into a draw for the chance to win a £50 Amazon voucher.

Questionnaire

1. Do you feel that the new arrangements for coursework will help to improve the course and reduce workloads?

   ☐ yes ☐ no

2. Do you welcome continued use of advanced notice elements in papers?

   ☐ yes ☐ no

3. We have to decide whether to limit the topic of AS presentations to materials, or to allow another application (imaging and communication). Which would you prefer?

   ☐ limit ☐ widen

4. Do you welcome a strengthening of work on measurement in the way suggested?

   ☐ yes ☐ no

5. Would you welcome a brief and simple introduction to relativity in A2?

   ☐ yes ☐ no

6. Would you welcome a little more about the nature of random events in A2, linking radioactivity, quantum ideas and noise?

   ☐ yes ☐ no

7. Should chapter 15, "Electromagnetism", continue to have an applied flavour,but be modified?

   ☐ yes ☐ no

8. It is proposed to simplify and clarify the Teachers' Guides, with more guidance on how to choose between resources. Is this welcome?

   ☐ yes ☐ no

9. Are there other aspects of the books that you think should be changed, if possible?

   ☐ yes ☐ no suggestions:

.....

10. Are there features of the CDs that you think should be changed, if possible?

    ☐ yes ☐ no suggestions:

.....

11. Do your students use the CDs? If not, suggest what might help.

    ☐ yes ☐ no suggestions:

.....

12. Would you welcome more material being on the *Advancing Physics* website? If so, please indicate what you would most like to see there.

    ☐ yes ☐ no suggestions:

.....

continued overleaf

Questionnaire continued

13. How long has your centre been teaching *Advancing Physics*?

☐ less than a year ☐ 1–3 years ☐ 4–6 years ☐ pilot school

14. How long have you been teaching *Advancing Physics*?

☐ less than a year ☐ 1–3 years ☐ 4–6 years ☐ pilot school

15. If you or your students use the CD, which version do you use?

☐ teacher network ☐ student network

☐ teacher standalone ☐ student standalone

16. Do you use the CD Quick Tour?

☐ yes ☐ no

17. Do you use the CD Revision Guide?

☐ yes ☐ no

18. Have you ever used any of the resources submitted to the web base?

☐ yes ☐ no

19. Do you subscribe to CAPT?

☐ yes ☐ no

20. Have you ever attended any of the Advancing Physics INSETS?

☐ yes ☐ no

Please add any further comments you would like to make:

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.....

.....

.....

Name .....

School .....

Address .....

E-mail .....

Tel. .....

Thank you for your feedback. To ensure that all comments are received in time, please detach and return the questionnaire by Monday 18 December to:Advancing Physics, Institute of Physics Publishing, Dirac House, Temple Back, Bristol BS1 6BE.

Advancing Physics INSET 2007, Birmingham University

Are you new to *Advancing Physics*, or do you feel the need to do a bit of catching up? Our INSET course will cover all aspects of teaching and learning, including a session on coursework. Courses will take place at the University of Birmingham's Department of Physics on the following dates:

Introduction to AS, Tuesday 3 July 2007

Introduction to A2, Wednesday 4 July 2007

Special rates are available for early bookers and schools that are affiliated to the Institute of Physics. To secure your place, please complete the booking form, which can be found online at **http://advancingphysics.iop.org/teacher/inset.html**.

INSET is also available for technicians. Further details of courses can also be found online at http://advancingphysics.iop.org/technician/index.html

Advancing Physics Revision Roadshow 2007

Join us this year as we take to the road to bring you another week of *Advancing Physics* Revision Roadshows. All venues will feature the AS and the A2 roadshows.

University of Birmingham, Monday 16 April 2007

University College, London, Wednesday 18 April 2007

University of Plymouth, Friday 20 April 2007

The cost is £20 per student, which will include lunch and refreshments. Accompanying teachers are free. To book, download and fill in the relevant booking form available online at **http://advancingphysics.iop.org/student/roadshow.html**.

Advancing Physics
Advancing achievement

NEWSLETTER

DECEMBER 2006

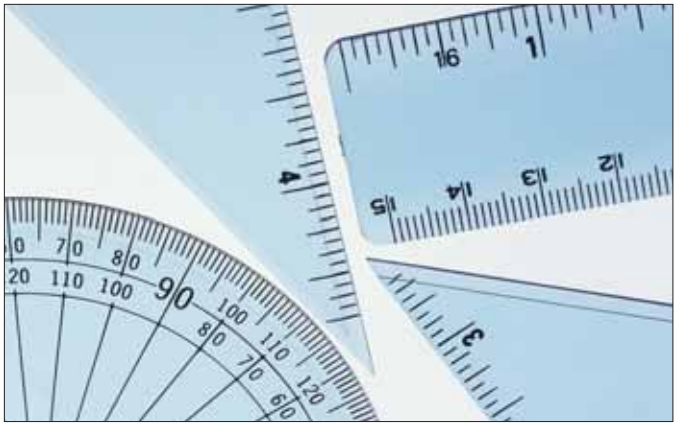
Course specifications up for fine-tuning

Advancing Physics, a lusty infant in 2000, is now due for revision and updating. New subject criteria that were introduced by the Qualifications and Curriculum Authority (QCA) this summer provide both the need and the opportunity to improve the course so that it will be even better at meeting its objectives. This is a chance to make it even more rewarding to teach and to learn – and to deal with a number of features that have, over the years, shown themselves to be not quite right.

An evaluation that was carried out about three years ago suggested that, although most aspects of the course met with substantial and widespread approval, some of them did need attention. Most salient was a desire to reduce the amount of coursework, and to simplify and to clarify assessment of it. John Miller's companion piece in this newsletter (p2) describes what we have in mind.

A good number of teachers wanted the *Teacher's Guides* on the CD-ROMs to provide a clearer indication of how to choose among the wealth of resources that they contain – a need that is particularly acute for those teachers who are new to the course. So this will be a central consideration when we are rewriting the guides.

Reviewing the content of the course, we also came to feel that the skills of making good measurements had not been as well developed as they could have been. Although work on sensors at AS-level pointed the way, with some stress on important properties such as sensitivity, resolution and response time, this was not followed up strongly enough to have an impact on students' experimental work, in the Sensor Project and later in investigations. Some schools have developed such ideas, and we will be capitalising on their work to offer new activities on measurement in AS and A2. The keynote will be pride in measuring well and in knowing how well you have done, based on the observed qualities of instruments and sensors – not on the statistical handling of "errors".



Planned measurement case-studies will meet new QCA requirements.

We aim to keep the thinking needed as common sense as possible. To help students to see the interest and practical value of this, case-studies in measurement will be added to the AS students' book. This section will have lively examples, ranging from new ways to calibrate hospital ultrasound equipment to the problems of the Hubble Telescope (a zero error with huge consequences) and the detection of ancient natural fission reactors in Africa.

This development addresses the new QCA requirements to integrate "how science works" into the course, because physics rests ultimately on experiment.

Other aspects, such as the ways that theories develop and change, and the consequences – good and bad – of the practical applications of physics, will also be strengthened. They were certainly always there in *Advancing Physics*, but somewhat on a "take it or leave it" basis. Now we will try to be clearer about what to do about them, with teaching resources to match. At the same time the course will remain a study of physics, not of social consequences. This is especially important for the maintaining of recognition by university departments.

The new QCA requirements demand no important changes in the overall structure and content of the course, so *Advancing Physics* will remain familiar to its users. There will be less emphasis on Snell's law and critical angles at AS-level, but otherwise most of the material will remain, with some of it (e.g. bandwidth) needing clarification and simplification. Not surprisingly it is the up-to-date examples that most rapidly go out of date, so several of these will be updated (e.g. fax communication and how CDs work).

We are thinking about a number of small changes to the A2 content. One tricky area is electromagnetism in chapter 15, where, to stay balanced, we would like to keep the strongly applied point of view, but we want to deal with the difficulties that it has thrown up.

A good number of teachers and students have said that they want to see a little on relativity, especially because the QCA core requires $e = mc^2$ but not any idea about where it comes from. Perhaps, also, there is a case for more about the nature of random events, given their across-the-board importance in radioactivity, quantum physics and noise. Your views on all of these ideas are welcome. Please see the questionnaire at the end of this issue.

Finally, there are lots of small deficiencies that must be repaired in the course materials. We have already identified and corrected lots of errors on the CDs. Another need is for a larger number of really simple introductory questions for students to help to build their confidence. These are lacking in a number of chapters.

We hope and intend that the new *Advancing Physics* will be thoroughly recognisable and familiar to users, requiring no large change of mindset. But we hope it will do an even better job than before of encouraging the lively teaching of physics for a wide variety and a large number of teachers and students.

Jon Ogborn, director, revised *Advancing Physics*