Report of the Curriculum Committee

11 January 2019

We met for two hours on 14 November 2018. Ivan Smith attended for the first hour to introduce and answer questions regarding the proposed changes to Metric & Topological Spaces, Analysis 2 and Geometry.

1 IB Metric & Topological Spaces, IB Analysis 2, IB Geometry

The Curriculum Committee received a proposal from two working parties, one chaired by Imre Leader to consider the overlap between Metric & Topological Spaces and Analysis 2, and another chaired by Ivan Smith to consider the teaching of geometry in Parts IA and IB.

In short, the proposal is

1. to remove Met & Top altogether and redistribute the content
2. into Analysis 2 (to be renamed Analysis & Topology) and
3. into Geometry (and extending Geometry from 16 to 24 lectures).

The Committee were very receptive to items (1) and (2) of the proposal. The background is this: the material in Met & Top is extremely important, yet by being lectured during the Easter term students do not have the chance to properly engage with this material, both because of the proximity to exam week and because the course is supervised in the following Michaelmas term by most colleges. (According to Imre, a very common comment on the feedback forms for Met & Top is 'very enjoyable, but wish we had time to think about the material like in a regular course'.) Furthermore, Analysis 2 cannot assume that the students have seen Met & Top (since not all IA students attend), leading to quite a bit of repetition. In particular, the current arrangement is suboptimal pedagogically and found boring by some students.

Items (1) and (2) address this well, and the proposed Analysis & Topology schedule proceeds from less abstract (uniform convergence) to more abstract (metric spaces) and even more abstract (topological spaces), always with material that students should find inviting. And as a side benefit, compactness would now be available, if desired, in Complex

Analysis. The Committee **recommends** removing Met & Top, and converting Analysis 2 into Analysis & Topology with the attached schedule.

The Curriculum Committee's reactions to item (3), the proposed changes to Geometry, were mixed. Some members were happy to recommend accepting the proposal as written; however, there were too many dissenting voices to reach a consensus on this recommendation.

We agree that the current Geometry course makes little sense in light of the changes introduced in items (1) and (2), but the uncertainty is in the shape of its replacement.

The background is this: the current Geometry course is considered difficult by the students and has a low exam take-up. There are several reasons for this, but one might be that the current schedule lacks a clear focus, with time split between symmetries & automorphism groups and surfaces & curvature. The material on symmetries is relatively easier, but does not connect well with other courses, in particular, the Part II geometry courses, whereas the more challenging material on surfaces is rather compressed.

The proposed replacement course would be focused exclusively on the geometry of surfaces. It would incorporate some material from Analysis 2, including the implicit function theorem, the relation between metrics in the sense of metric spaces and Riemannian metrics and recalls Picard's theorem when proving existence of geodesics.

According to Ivan, the geometry working party's aim was that the proposed 24 lecture course basically covers a subset of the old 16 lecture course, but cover it better – better in the sense of more coherently, with better motivation and context, rather than by fitting in more theory, digressions or applications.

However, some members of the Curriculum Committee were not convinced that this aim was met with the proposed schedule, and indeed, the proposed schedule appears to some as over-crowded and difficult. In particular, there was some concern that some material from Part II Differential Geometry has been brought forward, despite the reassurance of the working party that this more advanced material would be treated with a light touch.

It should be noted that some Committee members, including student members, were sympathetic to the working party's argument that including these topics help add context and motivation to this course, and having some familiarity with these topics would be useful for the Part II geometry courses.

However, given the current perception of IB Geometry as difficult, and with the recent history of IIC Geometry & Groups not succeeding, the majority of the Committee agreed that the proposed schedule should not be accepted without some revision. The Committee could support a friendlier, conceptually simpler, schedule with less non-introductory material.

Finally, it should be noted that a minority of the Committee argued that it would be better to keep the course at 16 lectures, essentially by trimming the lectures on symmetries and expanding the lectures on surfaces, without adding any additional material. One argument for this is that Lent term in IB is already very full, so there is little room to add an additional 8 lectures. Some of the student members argued that the distinction between a 16 and 24 lecture course is very minor in practice, and would be unlikely to alter student behaviour. This may be true for a single course and good students, but could be argued to

be less true in the context of the overall workload experienced by many in Lent term and for weaker students. Other 16 lecture courses could easily be expanded by bringing in Part II material, but there is an argument for restraint if IB courses are to be kept accessible to a wide range of students.

2 IIC Number Theory

The Teaching Committee asked us to consider whether there is too much overlap with IIA Number Theory with IA Numbers and Sets (Chinese remainder theorem, etc). We did not have time to have a full discussion of this issue, but this impression seemed correct. Number theorists have been consulted, and a proper proposal to address this issue should be considered in this or the following term.

3 IID Analysis of Functions

The Teaching Committee has asked us to consider whether the IID Analysis of Functions schedule is too full to be lectured properly. Again, we did not have time to have a full discussion of this issue. Although this impression seemed correct, we note that it is a new course and that the strike last year might have had a dramatic effect on the exam take-up. We do not have specific recommendation at this time, but we intend to monitor this course to ensure that it succeeds.

Michael Tehranchi (chair), John Lister, Jonathan Evans, Jack Button, Anthony Ashton, Balaji Krishna, Aled Powell, Valentin Hübner