

# Periodic Review of Mathematics and Statistics

## Introduction

- 1 An internal review of undergraduate and taught postgraduate programmes in the Department of Mathematics and Statistics was held on 20 and 21 April 2015. The members of the Panel were:
  - Professor Matthew Almond, Associate Dean (Teaching and Learning) for Arts, Humanities and Social Science (Chair)
  - Professor Neil Challis, Sheffield Hallam University
  - Professor Dugald Duncan, Heriot Watt University
  - Dr Steve Musson, Geography and Environmental Science
  - Dr Ioannis Oikonomou, ICMA Centre
  - Ms Natasha Travers, student member
  - Mrs Vicky Howard, secretary
  
- 2 The Panel met the following members of staff:
  - Professor Simon Chandler-Wilde, Head of School
  - Professor Paul Glaister, Head of Department (Academic Staff & Teaching)
  - Dr Steve Langdon, Head of Department (Academic Staff & Research)
  - Dr Bob Plant, School Director of Teaching and Learning
  - Dr Karen Ayres, Departmental Director of Teaching and Learning & Director of Undergraduate Studies
  - Dr Sarah Dance, School Senior Tutor
  - Dr Calvin Smith, School e-Learning Co-ordinator, UG Admissions Tutor & Director of Part 1
  - Dr Nick Biggs, Departmental Examinations Officer
  - Dr Peter Chamberlain, Departmental Work Placements Tutor
  - Dr Jochen Broecker, MRes in Mathematics of Planet Earth Co-Director
  - Ms Kate Shaw, School Disability Representative & School T&L Office Manager
  - Dr Zuowei Wang, Departmental Director of Internationalisation
  - Dr Danica Vukadinović Greetham, Departmental Employability Skills Tutor
  - Dr Tristan Pryer, Departmental Graduate Skills Officer
  - Ms Claire Newbold, School/Departmental Placements Officer
  - Dr Amos Lawless, School/Departmental Library Representative
  - Ms Hannah Fairbanks, Visit and Open Day Organiser

- Dr Pete Sweby, MMath Project Co-ordinator, Finance Officer & Director of Infrastructure and Support Staff
  - Mrs Alex Owen, School T&L Administrator
  - Ms Sophie King-Waring, School Undergraduate Administrator
  - Ms Jill Hazleton, Doctoral Training Centre Administrator
- 3 The Panel met students who represented the following degree programmes:
- BSc Mathematics
  - BSc Mathematics and Meteorology
  - BSc Mathematics & Statistics with a Placement Year
  - BSc Mathematics with a Placement Year
  - MMath Mathematics
  - BSc Applied Statistics
  - MRes in Mathematics of Planet Earth
- 4 The Panel met former students, who had graduated from the following degree programmes between 2012-2014:
- BSc Mathematics
  - MMath Mathematics
- 5 The Panel also met with two employers representing:
- Quintiles
  - Atomic Weapons Establishment (AWE)

## General observations

- 6 The Panel met with a range of staff, students and alumni during the Review process and wishes to thank all who participated for their contribution. The Panel was impressed by the Department's very positive response to the merger between Mathematics and Applied Statistics, which came into effect on 1 August 2010. The Department had been pro-active in reviewing its portfolio of programmes, which included the discontinuation of some programmes, the introduction of Statistics modules in Mathematics programmes and the introduction of a new MRes Mathematics for Planet Earth (jointly with Imperial College London).
- 7 The Panel observed a strong sense of community amongst students and staff within the Department. Peer support was evident across and within year groups, and, in particular, there appeared to be a strong sense of community on the MRes programme, which was well-developed, despite being split across two campuses. Teaching and Research staff all have the opportunity to contribute to the curriculum and the regular Teaching and Learning seminars appeared to be a good forum for disseminating good practice.

## Academic standards of the programmes

### **Educational aims of the provision and the learning outcomes**

- 8 In reviewing the educational aims and learning outcomes of programmes, the Panel considered a range of evidence, including programme specifications, module descriptions, student handbooks, external examiners' reports and annual programme

reports. It also held a number of meetings with staff and students, and read a sample of student work.

- 9 The Panel found that the aims and learning outcomes were entirely appropriate for high-quality mathematical sciences programmes. The external examiners verify the comparability with programmes in other universities in each of their annual reports, and this was supported by the graduates and employers who met with the Panel. The programmes are also consistent with the current and proposed new Subject Benchmarking Statements.
- 10 Staff and students appear to have a clear idea of the aims and learning outcomes of the programmes. This information is very clearly laid out in the formal programme specification documents and the individual modules are equally well documented. Student also receive the “Guide for Undergraduate Students in the Department of Mathematics and Statistics”, which is an excellent and encouraging guide on how to achieve the outcomes. The Guide specifies the various teaching, learning and assessment strategies.
- 11 The new MRes Mathematics for Planet Earth commenced in 2014-15. Whilst a few teething problems were reported by students in this first cohort, the problems have mainly been operational and have been addressed promptly. The Panel noted that a minor change in the assessment process was required, however communication between students and staff is excellent and this problem was satisfactorily resolved. The aims and outcomes of the programme and programme documentation did seem clear to the students. On the basis that the programme had only been operating for part of an academic year, the Department is asked to provide a fuller report on the progress of the MRes degree in the One-Year Follow-Up Report to the Periodic Review [**advisable recommendation (a)**].

## **Curricula and assessment**

### Curricula

- 12 As noted above, the merger of the Departments of Mathematics and Statistics resulted in changes to the curriculum offered by the newly merged Department, with a subsequent closure of Applied Statistics and postgraduate programmes. The Department is to be congratulated on its positive response to the merger and its provision of a coherent undergraduate curriculum, which offers some degree of flexibility. Statistics modules are now embedded in the curriculum, reflecting the importance of Statistics as an area of employment. The Panel commended the richness and variety of optional modules offered, which is exceptional given the size of the Department.
- 13 The Panel was satisfied that the content and design of programmes were appropriately informed by recent developments in teaching and learning and noted that the Department has made efforts to inform Teaching and Learning with the most recent research produced by members of staff, for example, in the use of research on Integral Equations in applications in meteorology in a module taught by Professor Simon Chandler-Wilde, and on the MRes.
- 14 The Panel was pleased to note the further work planned by the Department to review the curriculum and consider its design lengthways, to allow academic themes to be developed more strongly throughout Parts, with named members of staff being responsible for the development of each academic theme. In order to track and demonstrate the development of other practical and transferable skills within the

curriculum, the Panel recommends that named members of staff also be made responsible for the development of these other skills [**advisable recommendation b**].

- 15 The Panel supported the Department's ongoing work to identify ways to include real applications of mathematics and statistics in its teaching and assessment and noted that this will be partly realised with a new open-ended data analysis assessment for the Part 1 Probability & Statistics module in 2015/16, which will involve analysis of a real data set.

#### Assessment

- 16 External Examiners confirm that the standards achieved by students are appropriate to the award and align to external reference points and the Panel commended the production of a useful and comprehensive Department Assessment Policy for staff and the excellent statistics and paperwork provided to External Examiners [**good practice a**].
- 17 As part of its consideration of Student admission and progression (below), the Panel noted the significant work being undertaken by the Department to review its assessment design and process to boost student attainment. The Department's provision and analysis of student achievement is also outlined in **Use of student management information** below.
- 18 Assessment currently consists of a mixture of examination and coursework. While the assessment methods have diversified, for example with regular assessments in Part 1, the Department has a 30% coursework limit in Parts 3 and 4 modules which do not require a substantial practical component and there are areas, therefore, which are predominantly assessed by examination. Whilst the Panel recognises the importance of examinations in assessing Mathematics students, the Panel believes that some learning outcomes could still be met if more continuous assessment were introduced in some modules [**desirable recommendation a**]. The Department is asked to consider this possibility.
- 19 The Panel discussed in detail the Final Year Project, which was currently worth 10 credits, but which was considered by students to carry a heavy workload. Following discussions with and feedback from students and staff, the Panel recommends that the Department consider whether the credit value of the module might be increased to 20 credits. The Panel recognised that the Department does prepare students for the project, but that it would be worth highlighting to students the skills that they have developed throughout the programme which would help them to undertake the project. It appeared that students would benefit from guidance on time-management and the development of other practical and transferable skills required to undertake the project and to understand the amount of work required, irrespective of the eventual credit value of the module [**advisable recommendation c**].

#### **Use of student management information**

- 20 The Department makes extensive use of data from a range of sources, including the NSS, module and programme evaluations, classification data, External Examiners' Reports, and admissions data. The Department has strong systems in place to reflect on student performance and it was clear that the Boards of Studies and the Student-Staff Liaison Committees give appropriate consideration to relevant datasets, and that the Annual Programme Report addresses key issues.
- 21 The School had undertaken a detailed analysis of student progression and final degree classification, which has led to a series of evidenced recommendations and proposals

(see **Student Admission and Progression** below). The Panel was provided with statistical analyses of student performance by gender, ethnicity and age group. Although no significant patterns were identified, the Panel was confident that the mechanisms are in place to identify and respond to concerns in this area.

- 22 There are effective arrangements for collecting and evaluating feedback from students. Formal student evaluations are carried out for every module and there is clear evidence that convenors are reflecting on and responding to this feedback. There are mechanisms to allow communication between student representatives and staff at Department and School level. From discussions with students, it was clear these processes are popular and effective, with many issues being resolved quickly at a local level. This was particularly important to students on the MRes, who explained that initial teething problems were dealt with very efficiently [**good practice b**].
- 23 Academic standards in the programmes and component modules are monitored by the Undergraduate Programme Committee, which reports to the Board of Studies. Strategic enhancement activities are dealt with through a series of ad hoc committees. Several staff participate in subject-specific CETL and HEA enhancement events, while regular internal Teaching and Learning seminars are organised. There are separate arrangements for the MRes in Mathematics for Planet Earth, where a Joint Management Committee and Steering Committee are in place. At this stage, these appear to provide an appropriate mechanism for programme management and enhancement.
- 24 Based on External Examiners' reports and the Department's responses, it is clear that appropriate mechanisms are in place to address Examiner feedback and comments. Reports are discussed by the Undergraduate Programme Committee and relevant actions agreed. Although the Department has very good links with alumni and employers, the Panel felt that better use could be made of these, especially in the light of growing demand for student placements (See **Employer engagement** below).

## Quality of learning opportunities offered by the programmes

### Teaching and learning

- 25 The Department has taken a series of steps to ensure that the quality of teaching and learning is maintained and enhanced; one of the major initiatives has been to establish the Undergraduate Programme Committee which is responsible, inter alia, for matters including: curriculum design, content of programmes and modules, teaching provision, assessment and feedback, progression and achievement, employability, academic support, learning resources. The committee meets once a term, at a minimum, and comprises of a total of twelve member of academic staff and extends invitations to other members of staff for particular agenda items. It can provide a broad strategic overview of T&L matters and deal with more urgent issues and tackle relevant challenges. The Panel commended the inclusivity of the committee and decision-making processes.
- 26 The Panel commended the practice that research-intensive members of staff teach at least one module as evidence of the Department's willingness to engage all academic members of staff with Teaching and Learning processes [**good practice c**].
- 27 The Panel commended the Department's provision of prompt feedback to students, which had been well established prior to the introduction of the University's standard 15 day turnaround time for work. This was evidenced by the Self-Evaluation

Document, module evaluation forms, student work and discussions with both students and staff. It was clear to the Panel that the Department had responded fully to issues identified by students, including the provision of guidelines in common errors in exams on an annual basis.

- 28 The Department appeared to make effective and appropriate use of a variety of teaching methods and corresponding learning resources. Given the nature of the discipline, emphasis is in some cases placed more on traditional teaching methods (e.g. “chalk and talk”) rather than on Technology Enhanced Learning and this does not appear to be problematic or limiting. Indeed, discussions with students indicated their belief that “standard” and traditional teaching methods to be amongst the most effective when properly utilised by the lecturers and entirely appropriate for enhancing their engagement and participation.

### **Student admission and progression**

- 29 The Department has gradually increased its entry requirements over recent years, in order to improve quality and attainment. Whilst there had been a dip in enrolments in 2014/15, the Department believed this had been caused, in part, by low attendance on Visit Days, as well as an increased entry tariff. The Department’s concerns on arrangements for Visit Days had been communicated to the University and the number of visitors had subsequently picked up.
- 30 The transition from A-level to Part 1 appears to be managed well, with students gaining access to a Blackboard course three weeks prior to their arrival, which includes welcome information and preparatory materials. The student written submission commented positively on the support provided as part of the transition to University, whilst students who met with the Panel confirmed that this transition was smooth, but that they perceived there to be a significant leap in complexity and workload between Parts 1 and 2.
- 31 The Panel noted that, in response to the findings of the University’s Student Success Project, the Department was currently participating in the Student Attainment Project to review the curriculum and its delivery, in order to enhance student attainment. An initial analysis had indicated that students in the Department performed below the sector in terms of their overall degree classification (the percentage of Firsts and 2.1s is around 55% each year, against the 67% national figure for Mathematical Sciences) and that there was a significant dip in performance across the programmes, with students having exhibited a lower attainment at Part 3 than at Part 1.
- 32 It was evident that the Department was responding proactively and fully to the findings of the Projects and had already implemented or was due to implement a significant number of changes which the Panel hoped would boost student attainment throughout the programme. A complete list of initiatives was included in the Self-Evaluation Document and were discussed by the Panel with students and staff; initiatives included, but were not limited to:
- Change of Part 1 structure in 2013-14 to include some more challenging material and move of a Part 3 module (Complex Analysis I) to Part 2, in order to add additional challenge and improve student engagement;
  - Two modules in Part 1 have short weekly assessed work, to promote continuous engagement from the beginning, to help develop a strong work ethic;
  - Re-introduction of weekly monitoring of Part 1 tutorial attendance;

- Restructuring Parts 2-4 exam paper format (from 2014/15) to allow an element of choice of questions, plus to allow additional marks to be accrued from attempts at more than the required number of optional questions if a pass mark is otherwise not obtained;
- From 2014/15, two popular Part 3 modules have had a major class test in January instead of the summer exam, to reduce the number of exams to be sat in April/May;
- Adapted and used the University's pro-forma for coursework feedback, to provide generic and/or specific comments to highlight common misconceptions;
- Made use of Enhancement Week to develop more computational skills, to help improve confidence and expertise for later use of computing;
- Sent (since 2013/14) an aspirational email to finalists at the start of the academic year, highlighting what is needed to obtain a higher class than currently suggested by their existing Part average, to spur them on to greater achievements;
- Generic feedback will be provided as standard for each module after all summer exams, with the marker summarising common misconceptions appearing in scripts, to make it less likely that these misconceptions will be carried forward;
- An exam performance summary email will be sent to each Part 1 and 2 student (and Part 3 MMath) after publication of results which will include the grade obtained on each question of every MA and ST paper they have sat this year (and papers will be made available on Blackboard in case students did not take away a copy);
- For a sample of modules, provision of self-study and self-assessment material covering pre-requisite topics, to help students be better prepared for the new academic year (and to reduce compartmentalising);
- BSc Maths and BSc Maths & Stats to have a choice of the 10 credit maths project, or a 20 credit statistics project;
- BSc Maths to allow up to 20 credits of optional modules to be chosen from outside the Department in Part 2 and Part 3. For Part 2 there will be a defined list of options (Modern Language, Practice of Entrepreneurship, Science of Climate Change), but for Part 3 the list of options will include a Modern Language plus any Part 3 module that does not require pre-requisites;
- Diagnostic tests at the start of the academic year on material from previous years, or a small weighted piece of coursework in a module at the start on pre-requisite material (matching assessable learning outcomes), to reduce compartmentalising.

33 The Panel commended the significant work under way to boost student attainment, and, in particular, commended as an example of good practice the circulation of an aspirational email to finalists at the start of the year [**good practice d**]. The Panel recommends that the Department monitors marks closely and the impact of its initiatives and identify further mechanisms to address any concerns in respect of student attainment [**advisable recommendation d**].

34 The Panel noted concerns from the Department that the University's new Part 2 progression rule, introduced in 2013/14, whereby students could not pass the year if they had any module mark below 30%, or more than 40 credits below 40% (as opposed to the previous rule which condoned up to 20 credits to be below 30%), was disadvantageous to students in the Department. This opinion was reiterated by students who met with the Panel and in the student written submission. Cohort statistics data indicated that where the Part 2 progression rate amongst those attempting assessment was high for 2012/13 (99%) (from 90% in 2011/12), in 2013/14

this dropped to 87%. The Department believes that the new rules are responsible for the drop in its progression rates, and the loss of some students in 2014/15 who the Department felt were otherwise capable of graduating with a degree. Students and staff believe that the discipline is one where it is possible to have a profile including some very high marks and some very low marks and has therefore argued that it would be appropriate to operate according to an alternative set of progression rules. The Panel noted that the QAA Subject Benchmark statement for Mathematics, Statistics and Operational Research (MSOR) stated that, “Institutions should accept that the patterns of marks achieved in MSOR assessments are likely to differ substantially from those achieved in other subjects”.

- 35 The Panel noted that the University Board for Teaching and Learning had previously rejected a request from the Department for an alternative set of progression rules in 2012. Following discussions earlier in 2014-15, the Sub-Committee on the Delivery and Enhancement of Learning and Teaching (DELT) had agreed to continue to monitor the impact of the new progression rules and to revisit the issue in the Autumn Term 2015 after the completion of the current year’s examination cycle. In light of feedback from students, staff and external Panellists, and having carefully considered student progression and degree classifications, the Panel considers that some students may be disadvantaged by the University’s regulations on progression. The Panel therefore supports DELT’s decision to monitor the impact of the new progression rules following the completion of the current year’s examination cycle and, on the basis of the information currently available, would support a variation on the current progression rule. **[advisable recommendation to the University a]**. The Panel noted that conducting a review at this point would also allow the Department and University to assess the initial impact of the Department’s many initiatives to boost student attainment on rates of student progression and attainment.
- 36 The Panel noted the seemingly strong sense of community between its undergraduate students and supports the Course Parent system whereby Part 4, 3 or 2 students are paired with Part 1 students. The Panel believes that the system will be very useful in the communication of the importance of attendance, participation and engagement of students at this level, with the possibility, therefore, of boosting student attainment and progression.
- 37 There are many opportunities for students to undertake extra-curricular activities, including the STEMath Ambassador scheme, the University’s Student Tutoring scheme, the University’s Feedback scheme and the Department’s Maths Squad scheme, which involves staff and students volunteering to deliver short maths sessions in local primary schools. Students can also attend and/or present at, the Department’s Teaching & Learning seminar series.
- 38 Careers learning takes place in Part 2 through the Careers Management Skills component of MA2GS General Skills, in Autumn Term lunchtime sessions aimed at students interested in applying for placements, and in the Enhancement Week careers sessions organised by Careers. The Panel has identified further ways to enhance careers learning under **Employer Engagement**, below.

### **Learning resources**

- 39 The Panel agreed that the cohort of staff provide the collective expertise to deliver the full curricula and allow the intended learning outcomes of those programmes to be achieved. The expertise of staff covers a wide range of areas, giving teaching strengths in pure and applied mathematics and theoretical and applied statistics.

- 40 The Department has staff fulfilling a wide range of Teaching and Learning functions and it is clear that staff work well as a team to maintain a very high standard of provision across all areas. There is clearly strong technical and administrative support within the Department and the student experience is enhanced by this coordinated and collegiate approach to the delivery, administration and enhancement of Teaching and Learning. Furthermore, Departmental staff work effectively with central university support staff.
- 41 Whilst the Panel noted that suitable resources existed in terms of teaching accommodation, equipment, IT facilities and library stocks, it noted that:
- a) as “chalk and talk” teaching plays an important role in the teaching of Mathematics, the University must ensure that in the development or refurbishment of teaching spaces this diversity of teaching styles is recognised and supported. In particular the provision of large white boards is important in Maths teaching. **[advisable recommendation to the University b];**
  - b) the MRes Mathematics for Planet Earth with Imperial College London has a particular demand for very high quality IT provision in order to deliver the taught material most effectively, particularly due to aspects of distance learning. Continued enhancements in this area of provision are therefore required and should be monitored by the Department **[advisable recommendation e];**
  - c) there have been some issues reported by the School Teaching Office regarding access to information on RISIS. The University is asked to note that Departmental staff had found certain aspects of RISIS, e.g. those relating to student disabilities, to be difficult to manipulate, and in some cases it appeared to be difficult for School administrative staff to access the data they need. **[advisable recommendation to the University c]**
- 42 Discussions with alumni and graduate employers indicate that exposure to certain statistical and mathematical software is highly valued. Given the space constraints that the Department faces it does not appear feasible to have a fully equipped computer lab for this purpose but the Panel suggests that the Department could explore the possibility of buying (or subsidising the purchase of) specialised software for its students, to be used on their own devices.
- 43 Learning resources are inclusive and support the diversity of the student cohort. However, the Panel notes that there is a proportion of mathematics students with dyslexia and spectrum disorders which is higher than the average for UK undergraduate students. This can place a burden upon academic and administrative staff within the Department. It is very important that appropriate training is available for all such staff in order to support students and to determine what learning resources are most needed. The University is therefore asked to review and consider increasing its provision of training in the area of disabilities for Disability Representatives **[advisable recommendation to the University d]**. Nonetheless, the Department provides excellent and professional support to students, an example of which is the provision of specialised notes and materials to students **[good practice e]**.

### **Employer engagement**

- 44 Mathematical Sciences graduates are in strong demand in many different types of graduate jobs and therefore there is no single mathematics or other employers’ organisation to work with. The Department's graduates are also in strong demand,

although a disappointing employment rate was reported in the 2011/12 Destination of Leavers in Higher Education (DLHE) survey. In response, an Employability Task Force was established and additional support was allocated to the Department from the Careers, Placements and Experience Centre, with DLHE results improving since 2011/12.

- 45 The Department is making significant progress in increasing the number of students undertaking placement opportunities, with five students currently on placement and 13 expected to take placements in 2015-16. Students can now apply for entry to a year-long placement version of all of the Department's programmes, as well as being permitted to transfer to placement versions once at the University.
- 46 It was evident that the publicity and information provided to students from the outset of their studies on placements had helped to foster an awareness of the options for future employment. As participation in placement opportunities increases, there will be opportunities for returning placement students to pass on their experiences to others and for building relationships between the Department and employers. The Panel believed the role of a placement officer to be invaluable and commended the provision of a revision guide to students returning to University following the completion of a placement, to prepare them for a return to study [**good practice f**].
- 47 The Department has and is continually expanding a good set of employer contacts, not least in following its graduates' career developments and asking for their help with activities for current students, including Part 2 "Meet the employers" sessions. Informal feedback from graduates and employers is valued, and it may be possible to build on the activities outlined already to seek advice from employers in a more structured way. The Department is therefore asked to consider whether it might establish an industrial advisory group in order to consolidate and develop further the provision of placement opportunities; increase employer engagement in the curriculum and develop students' employability skills [**desirable recommendation b**].
- 48 The Department has good mechanisms to support students wishing to pursue teaching posts. Students are encouraged to carry out teaching projects in the summer term and participate in local schools through the 'Student Tutoring in Schools' scheme. Given that the teaching profession is a major employer of Maths graduates, the Department is asked to consider whether it might establish a teachers' forum [**desirable recommendation c**].
- 49 The Panel was pleased to note that feedback received from employers and graduates on the employability of students in the Department was very positive.

## Enhancement of quality and academic provision

- 50 The Department has very many mechanisms by which it enhances the quality of its provision. Alongside the more formal routes (which clearly work very well), such as discussions at Boards of Studies and staff meetings, these include regular Teaching and Learning seminars in which best practice is disseminated to staff. The Panel noted the strong sense of community and collegiality within the Department. It is clear that all staff - including the more research-focussed staff - have many opportunities to contribute to the curriculum.
- 51 The Department likewise has a very wide range of mechanisms for including students in the development and enhancement of the curriculum. Student Course Representatives are strongly encouraged to provide feedback within and outwith the

normal committee cycle. The Self-Evaluation Document lists a number of improvements that have been made to programmes as a result of student feedback.

- 52 The Panel commended the ways in which the Department uses the Personal Tutorial System to support students academically and pastorally, including: a pre-university academic questionnaire completed by students for discussion at their first Personal Tutorial meeting and the provision to the Personal Tutor of students' marks for discussion throughout the students' degree programmes [**good practice g**].
- 53 The Panel considered that it was indicative of the excellent way that the Department utilises student input that a student written submission has been made alongside the SED to the periodic review Panel. Students and staff had engaged thoughtfully with the process and it was evident that the Department had carefully considered and responded to comments from students [**good practice h**].
- 54 The School has developed an appropriate forward-looking plan for developing its academic provision. It should be noted that this has been done at a time of great change in which the Department of Mathematics merged with the Section of Applied Statistics and subsequently the new Department has had to make a number of very difficult decisions, including the withdrawal of single-honours Statistics degrees and MSc programmes in Mathematics. Subsequently a new MRes programme in Mathematics for Planet Earth has been developed with Imperial College London. Out of all of this change has emerged a clear and coherent forward-looking plan. As observed above, the Department is to be commended for maintaining such a positive forward-looking approach at a time of such considerable change. The key areas at which the Department is looking are:
- a) Developing Streams and Lengthways pathways within the curriculum;
  - b) Implementing a Careers strategy to develop graduate skills within the curriculum;
  - c) Considering its Admissions Strategy;
  - d) Looking at Education- and Research-focused modules;
  - e) Considering a wider range of assessment methods;
  - f) Engaging with the University project in Peer-Assisted Learning;
  - g) Partnership for a 3+1 programme with Nanjing University of Information Science and Technology (NUIST), China;
  - h) Looking at its Masters provision including a proposed MSc in Actuarial Science
- 55 Appropriate development opportunities are available to all staff. It is clear that the Department is working towards the goal of HEA fellowship (or the higher categories of fellowship) for the large majority of staff and that this is being actively promoted.
- 56 In reviewing the current portfolio of programmes and future plans, the Panel agreed to ask the Department to consider whether it might establish an MSc in Mathematics, given that modules at level 7 were already provided and would therefore be a low-cost source of revenue. Incoming undergraduate students from NUIST would also represent a possible source of recruitment for Masters programmes in the Department (**desirable recommendation d**).

## Main characteristics of the programmes under review

- 57 The Panel has congratulated the Department on its positive response to the merger of Mathematics and Applied Statistics and its continued provision of a coherent undergraduate curriculum; the richness and variety of optional modules offered is exceptional given the size of the Department. The Department engages fully with student input, which was demonstrated by the provision of a student written submission and the changes the Department has made to programmes in response to student feedback. The Department has also responded positively and pro-actively to findings in respect of student attainment, implementing and planning for a significant number of changes to provision, in order to boost overall levels of attainment. The Department makes excellent use of statistical information, which goes far beyond the minimum requirements of the University.

## Conclusions on innovation and good practice

- 58 The Panel identifies the following as representing particularly good practice:
- a) The Panel commended the production of a useful and comprehensive Department Assessment Policy for staff and the excellent statistics and paperwork provided to External Examiners.
  - b) It was clear that processes for communication between student representatives and staff at Department and School level are popular and effective, with many issues being resolved quickly at a local level. This was particularly important to students on the MRes, who explained that initial teething problems were dealt with very efficiently.
  - c) The Panel commended the practice that research-intensive members of staff teach at least one module as evidence of the Department's willingness to engage all academic members of staff with Teaching and Learning processes.
  - d) The Panel commended the significant work under way to boost student attainment, and, in particular, commended as an example of good practice the circulation of an aspirational email to finalists at the start of the year.
  - e) In the area of disabilities, the Department provides excellent and professional support to students, an example of which is the provision of specialised notes and materials to students.
  - f) The Panel believed the role of a placement officer to be invaluable and commended the provision of a revision guide to students returning to University following the completion of a placement, to prepare them for a return to study.
  - g) The Panel commended the ways in which the Department uses the Personal Tutorial System to support students academically and pastorally, including: a pre-university academic questionnaire completed by students for discussion at their first Personal Tutorial meeting and the provision to the Personal Tutor of students' marks for discussion throughout the students' degree programmes
  - h) The Panel considered that it was indicative of the excellent way that the Department utilises student input that a student written submission has been made alongside the SED to the periodic review Panel. Students and staff had engaged thoughtfully with the process and it was evident that the Department had carefully considered and responded to comments from students.

## Conclusions on quality and standards

- 59 The Panel has concluded that the quality and standards of the programmes reviewed are appropriate.

## Recommendations

- 60 The Panel **recommends** to the Faculty Board for Teaching and Learning of the Faculty of Science and Life Sciences that the following degree programmes be re-approved to run for a further six years or, in the case of joint programmes, until the Periodic Review of the other discipline:

- BSc Mathematics
- BSc Mathematics with a Placement Year
- MMath Mathematics
- MMath Mathematics with a Placement Year
- BSc Mathematics & Statistics
- BSc Mathematics & Statistics with a Placement Year
- BSc Applied Statistics [until 2015/16]
- BSc Mathematics & Applied Statistics [until 2015/16]
- BSc Statistics [until 2014/15]
- BSc Business Statistics & Marketing [until 2014/15]
- BSc Computational Mathematics
- BSc Computational Mathematics with a Placement Year
- BSc Mathematics & Psychology
- BSc Mathematics & Psychology with a Placement Year
- BSc Mathematics & Meteorology
- BSc Mathematics & Meteorology with a Placement Year
- MMath Mathematics & Meteorology
- MMath Mathematics & Meteorology with a Placement Year
- BSc Mathematics with Finance & Investment Banking
- BSc Mathematics with Finance & Investment Banking with a Placement Year
- BSc Mathematics & Economics
- BSc Mathematics & Economics with a Placement Year
- BSc Mathematics & Economics with a Study Abroad Year
- MRes Mathematics for Planet Earth (with Imperial College London)

- 61 The Panel does not consider that any recommendations must be addressed as a condition of re-approval.

- 62 The Panel recommends that the following actions be taken by the School:

**Advisable actions:**

- a) On the basis that the programme had only been operating for part of an academic year, the Department is asked to provide a fuller report on the progress of the MRes degree in the One-Year Follow-Up Report to the Periodic Review.
- b) In order to track and demonstrate the development of other practical and transferable skills within the curriculum, the Panel recommends that named members of staff also be made responsible for the development of these other skills within the curriculum.
- c) The Panel recommends that the Department consider whether the credit value of the Final Year Project module might be increased to 20 credits. The Panel recognised that the Department does prepare students for the project, but that it would be worth highlighting to students the skills that they have developed throughout the programme which would help them to undertake the project. It appeared that students would benefit from guidance on time-management and the development of other practical and transferable skills required to undertake the project and to understand the amount of work required, irrespective of the eventual credit value of the module.
- d) The Panel recommends that the Department monitors marks closely and the impact of its initiatives and identify further mechanisms to address any concerns in respect of student attainment.
- e) Given that the MRes Mathematics for Planet Earth has a particular demand for very high quality IT provision in order to deliver the taught material most effectively, the Department should ensure and monitor continued enhancements in this area of provision.

**Desirable actions:**

- a) Whilst the Panel recognises the importance of examinations in assessing Mathematics students, the Panel believes that some learning outcomes could still be met if more continuous assessment were introduced in some modules. The Department is asked to consider this possibility.
- b) The Department is asked to consider whether it might establish an industrial advisory group in order to consolidate and develop further the provision of placement opportunities; increase employer engagement in the curriculum; and develop students' employability skills.
- c) Given that the teaching profession is a major employer of Maths graduates, the Department is asked to consider whether it might establish a teachers' forum.
- d) The Department is asked to consider whether it might establish an MSc in Mathematics.

63 The Panel recommends that the following actions be taken by the University:

**Advisable [University]:**

- a) In light of feedback from students, staff and external Panellists, and having carefully considered student progression and degree classification, the Panel considers that

some students may be disadvantaged by the University's regulations on progression. The Panel therefore supports DELT's decision to monitor the impact of the new progression rules following the completion of the current year's examination cycle and, on the basis of the information currently available, would support a variation on the current progression rule.

- b) As "chalk and talk" teaching plays an important role in the teaching of Mathematics, the University must ensure that in the development or refurbishment of teaching spaces this diversity of teaching styles is recognised and supported. In particular the provision of large white boards is important in Maths teaching.
- c) The University is asked to note that School staff had found certain aspects of RISIS, e.g. those relating to student disabilities, to be difficult to manipulate, and in some cases it appeared to be difficult for School administrative staff to access the data they need.
- d) The University is asked to review and consider increasing its provision of training in the area of disabilities for Disability Representatives in light of the feedback provided by the Department.