THE 'NEW' MATHEMATICS ADVANCED LEVEL SYLLABUSES

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The content of the Sixth Form Mathematics courses has in the past been dictated by University entry requirements and has catered exclusively for the specialists in the subject. The curriculum centred around a syllabus form of the G.C.E. boards and efforts were concentrated on a small group who could obtain good grades in Pure Mathematics and perhaps Applied Mathematics in the hope that the grades were good enough for entry into one of the specialised courses in Mathematics, Physics and Engineering. The level of the teaching and the pace at which it had to be sustained made conditions rather difficult for a large number of students who had done sufficiently well in the ordinary level examinations to opt for mathematics in the sixth form and who had their minds set for a course at tertiary level.

The needs of such courses have in the past determined the curriculum pattern in the sixth form and prevented development along lines which would cater for the needs of those students, continually increasing in number, who are not proceeding to a specialist course. An equilibrium state was desired where the mathematical needs of the majority of the students who require mathematics as a service subject for other studies are being taken into consideration alongside the needs of the specialist.

A new structure for examination in mathematics at this level has been adopted by a number of G.C.E. boards on the basis of a two level division of the subject: Mathematics and Further Mathematics. This new scheme, provides a suitable single subject Mathematics for non-specialist mathematics students and those wishing to do some mathematics at this level. Further Mathematics provides a second subject for specialist mathematics students and for those students, for example physicists, whose interests require a wider study of mathematics but not necessarily at a great level of difficulty.

One may argue at this point that a solution had in fact existed and was provided by a pass at advanced level in Pure and Applied Mathematics for good performances in the first papers of these two subjects. This provision was no solution and proved impracticable and contrary to the best interests of the students and was not recognised as valid by

the University entry requirements.

The isolation of Applied Mathematics as a subject on its own without any obligatory connections to Pure Mathematics proved to be undesirable and in 1974, the University of London, G.C.E. Board, with which most sixth forms in Malta are associated, announced the new syllabuses in Mathematics at advanced level. These were Mathematics (Syllabus D. Subject No. 391), Further Mathematics (Syllabus D. Subject No. 392) and Pure Mathematics (Subject No. 405) which replaced the subjects Pure Mathematics, Applied Mathematics and Mathematics (Pure and Applied). The need for a subject Pure Mathematics was recognised as a subject with its own intrinsic interest and also as one which was more appropriate to serve certain courses of study. Some years previous to this announcement another new syllabus was started. This took the shape of Mathematics (Syllabus C. Subject No. 381) and Further Mathematics (Syllabus C. Subject No. 485) — which covered 'modern' topics. The Mathematics D and Pure Mathematics syllabuses replaced 'traditional' ones and remained in content mostly so. Yet a move towards a more 'modern' approach was attempted. A section on probability has been included in the D syllabuses as well as the ideas and uses of vectors and matrices. Inequalities, numerical methods and differential equations figure prominently in the syllabuses as important topics, the latter two particularly in the applied section. Candidates are encouraged to use 'modern' language and symbolism in their solutions of problems.

Mathematics D and Further Mathematics D examinations are each made up of three papers — a multiple choice 1 hour paper, a Pure Mathematics $2\frac{1}{2}$ hour paper and an Applied Mathematics $2\frac{1}{2}$ hour paper. Short Section A questions appear in both papers 2 and 3. The use of multiple choice and short section A questions was recognised as important since these are more objective and give good syllabus coverage. The Pure Mathematics examination made up of two 3 hour papers also contains short section A questions. Certain sections of the new syllabuses may not be susceptible to short-answer techniques. These have nevertheless been included both as interesting and relevant topics and in an attempt to avoid the syllabuses being too limited and narrow. There is therefore a wide choice of conventional long-answer questions in the examination in each subject, questions which also test the ability to follow through an extended argument.

Each of the Mathematics C and Further Mathematics C examinations consists of two 3 hour papers containing a mixed selection of long—answer questions on Pure and Applied Mathematics. It remains the syllabus which has resisted the inclusion of multiple choice and short questions and one with the widest range of topics possible for a single Mathematics or a double Mathematics subject. It is, in my opinion, the best syllabus that caters exclusively for the needs of the student specialising in mathematics.

Our University, aware of these changes in the Mathematics syllabuses has recently made provisions in the regulations to accept passes in these subjects as alternatives for the existing entry requirements. With all this in mind, can one suggest which syllabus fits best which course at tertiary level? Surely the 'modern' Mathematics C syllabus as a single subject favours those students preparing for a B.A. (Educ.), B.A. (Business Management), B.A. (Administration), B.A. (Accountancy) or a B.Sc. (Mathematics) course. The unique sections on statistics, flow diagrams and group theory plus a thorough calculus course prepare the student for the more rigorous treatment encountered at the University.

Mathematics D and Further Mathematics D favour the engineering student and together with Physics ought to prepare him more than adequately for the course at tertiary level. Yet I feel that this choice of Mathematics D as a double subject restricts the possibilities of the student. After two years at the sixth form the student practically emerges with two good (Mathematics and Physics) subjects at advanced level yet with a narrow range of specialization. Surely Chemistry together with Physics and a single subject Mathematics D allows for a wider choice. Herein lies the weakness of specialization too early in the sixth form.

Pure Mathematics remains a subject interesting for its aesthetic values yet barely practicable. It is usually chosen by students who have done relatively well in their ordinary level courses and who would like to delve deeper into a 'favourite' subject, but who have not undertaken any supporting science courses. It is usually chosen alongside two other 'Art' subjects and is normally abandoned at tertiary level, now more so, owing to the restructuring of the B.A. courses. However, one must point out that Pure Mathematics practically consists of the Pure sections in Mathematics D and Further Mathematics D and is therefore quite exhaustive as a single subject in its particular branch. Taken alongside two other science subjects (one of which preferably Physics) it will prepare very adequately the student aiming at a B.E. & A course at the University. For the student (particularly the science student) wishing to do some mathematics at advanced level, Mathematics D as a single subject, is more than appropriate.

All these syllabuses naturally assume a good mathematical background at ordinary level. It is desirable that the 'modern' approach undertaken in the advanced level courses together with an early familiarization of 'modern' Applied Mathematics be extended to the ordinary level courses where an adequate breeding ground for potentially good mathematicians must be established.

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