



**REPORT
Of the Expert Panel
on the
RE-ACCREDITATION OF
Department of Mathematics, University of Rijeka**

**Date of the site visit:
April 13th 2015**

September 2015

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INTRODUCTION

This report on the re-accreditation of the Department of Mathematics University of Rijeka was written by the Expert Panel appointed by the Agency for Science and Higher Education, on the basis of the self-evaluation of the institution and supporting documentation and a visit to the institution.

Re-accreditation procedure performed by the Agency for Science and Higher Education (ASHE), a public body listed in EQAR (European Quality Assurance Register for Higher Education) and ENQA (European Association for Quality Assurance in Higher Education) full member, is obligatory once in five years for all higher education institutions working in the Republic of Croatia, in line with the Act on Quality Assurance in Higher Education.

The Expert Panel is appointed by the ASHE Accreditation Council, an independent expert body, to perform an independent peer-review-based evaluation of the institution and their study programs.

The report contains:

- a brief analysis of the institutional advantages and disadvantages,
- a list of good practices found at the institution,
- recommendations for institutional improvement and measures to be implemented in the following period (and checked within a follow-up procedure),
- detailed analysis of the compliance to the Standards and Criteria for Re-Accreditation.

The members of the Expert Panel were:

- Professor Madjid Merabti, *School of Computing & Mathematical Sciences at Liverpool John Moores University* – panel chair
- Professor Hugh J. Byrne, *FOCAS Institute, Dublin Institute of Technology*
- Professor Donald Sannella, *School of Informatics at University of Edinburgh*
- Professor Luka Grubišić, *Department of Mathematics, Faculty of Science, University of Zagreb*
- Valentina Gačić, *Department of Physics, Faculty of Science, University of Zagreb* – student.

In the analysis of the documentation, site visit and writing of the report the Panel was supported by the ASHE staff:

- Marina Cvitanušić Brečić, coordinator
- Neven Kovačić, support to the coordinator
- Lida Lamza, translator

During the visit to the Institution the Expert Panel held meetings with the representatives of the following groups:

- The Management at the University level;
- The Management at the Department level;
- The Working Group that compiled the Self-Evaluation;
- Teaching assistants and junior researchers;
- Teaching staff (full-time employed);
- The students (self-selected set of students present at the interview);
- The person(s) in charge of student and teaching issues;
- Administrative staff;

The Expert Panel also had a tour of the library, IT rooms, student register desk, and the undergraduate teaching laboratories and classrooms as well as research laboratories at the Department of Mathematics University of Rijeka, where they held a brief question and answer session with the students and staff who were present.

Upon completion of re-accreditation procedure, the Accreditation Council renders its opinion on the basis of the Re-accreditation Report, an Assessment of Quality of the higher education institution and the Report of Fulfilment of Quantitative Criteria which is acquired by the Agency's information system.

Once the Accreditation Council renders its opinion, the Agency issues an Accreditation Recommendation by which the Agency recommends to the Minister of Science, Education and Sports to:

1. **issue a confirmation** to the higher education institution, which confirms that the higher education institution meets the requirements for performing the higher education activities or parts of activities, in case the Accreditation Recommendation is positive,
2. **deny a license** for performing the higher education activities or parts of activities to the higher education institution, in case the Accreditation Recommendation is negative, or
3. **issue a letter of recommendation** for the period up to three (3) years in which period the higher education institution should remove its deficiencies. For the higher education institution the letter of recommendation may include the suspension of student enrolment for the defined period.

The Accreditation Recommendation also includes an Assessment of Quality of the higher education institution as well as recommendations for quality development

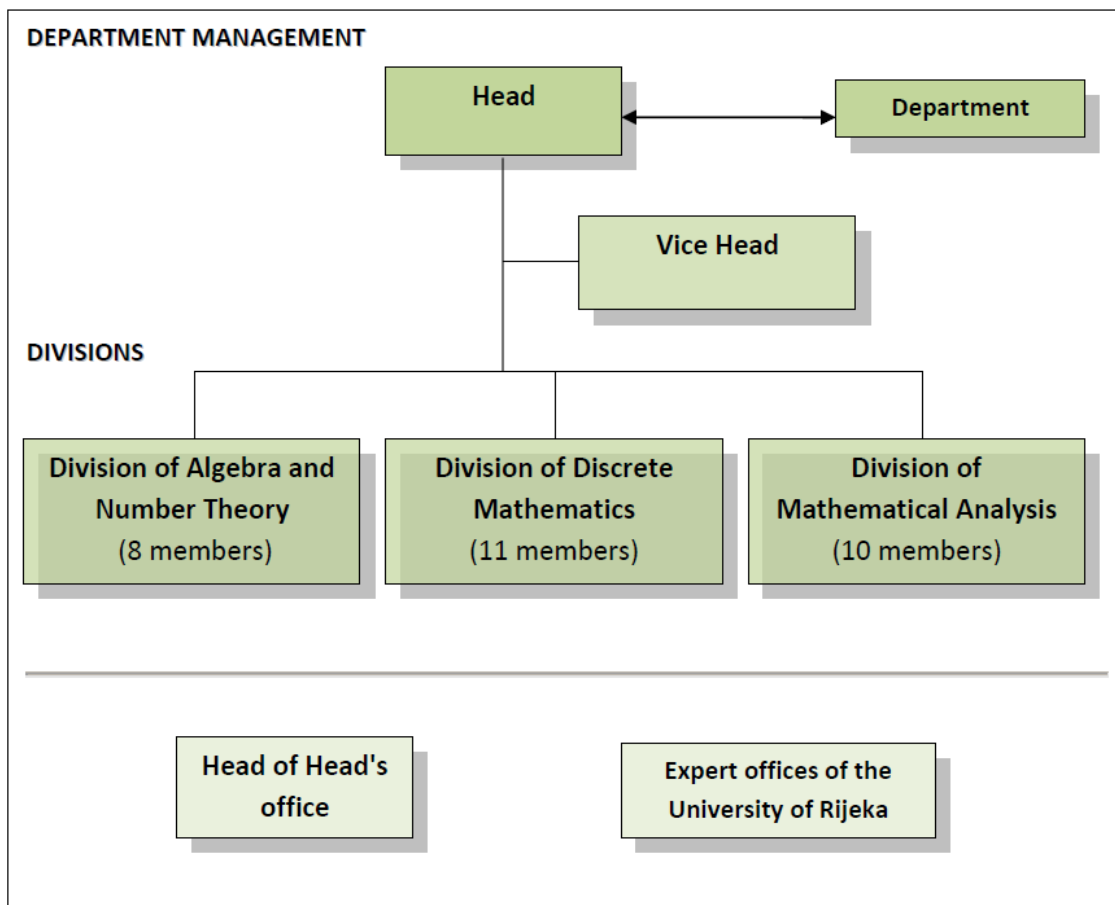
SHORT DESCRIPTION OF THE EVALUATED INSTITUTION

NAME OF HIGHER EDUCATION INSTITUTION: Department of Mathematics, University of Rijeka

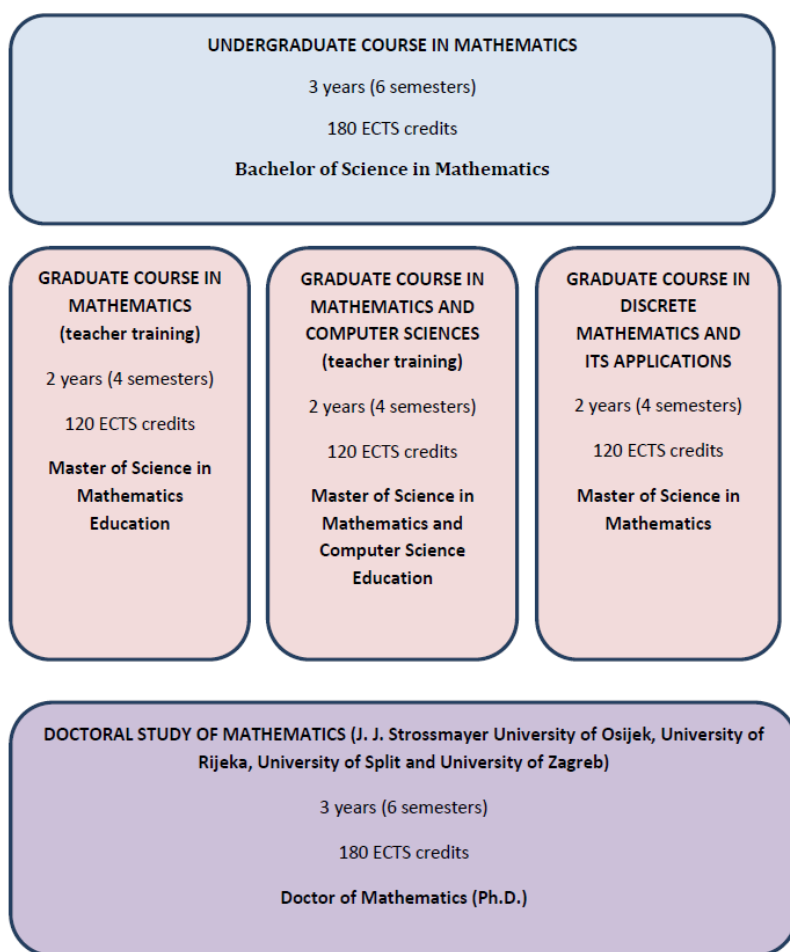
ADDRESS: Radmile Matejčić 2, 51000 Rijeka

NAME OF THE HEAD OF HIGHER EDUCATION INSTITUTION: Assoc. Prof. Sanja Rukavina, Ph.D.

ORGANISATIONAL STRUCTURE (e.g. chairs, departments, centres):



LIST OF STUDY PROGRAMMES (and levels)



NUMBER OF STUDENTS (part-time/full-time/final-year):

Study programme	Full-time students	Part-time students	Senior undergraduate students ('absolvents')
Undergraduate Course in Mathematics	138	0	0
Graduate Course in Mathematics (teacher training)	1	0	0
Graduate Course in Mathematics and Computer Sciences (teacher training)	26	0	1
Graduate Course Discrete Mathematics and its Applications	5	0	2
TOTAL	170	0	3

Remarks:

*The data for AY 2013/2014

NUMBER OF TEACHERS (full-time, external associates): Full-time – 8 (source: Self-evaluation, Table 4.1.)

NUMBER OF SCIENTISTS (doctors of science, elected to grades, full-time):

- Dr.sc.(PhD) - 15 employees
- Mr.sc. – 1 employee

Source: Self-evaluation, Table 4.3 List of teachers

TOTAL BUDGET (in kunas): for the year 2013.

TOTAL INCOME (A)	5.137.496,86 kn
TOTAL EXPENSES (B)	5.148.168,40 kn
Balance from previous year (C)	511.660,38 kn
TOTAL BALANCE (A-B+C)	500.988,84 kn

MSES FUNDING (percentage): 4.886.661,65 kn (95,11%)

OWN FUNDING (percentage): no data available

SHORT DESCRIPTION OF HIGHER EDUCATION INSTITUTION:

The Department of Mathematics - University of Rijeka is relatively recently established (2008), but has roots in the Department of Mathematics and Physics at the Higher Vocational School of Pedagogy in the 1960s.

The Department of Mathematics had relocated, in 2012, to new premises in the University Campus.

It consists of 3 divisions: Division of Algebra and Number Theory (8 members), Division of Discrete Mathematics (11 members), and the Division of Mathematical Analysis (10 members).

The Departments participates, as a member, in the Croatian Doctoral Program in Mathematics which is administered by the University of Zagreb and with further partnership with J.J Strossmayer University of Osijek and University of Split.

In 2013/2014, the Department had a total number of 30 employees including 11 teaching staff and 173 students enrolled on its study programmes. In addition, the Department of Mathematics participates in teaching mathematical courses on several constituents of the University: the Department of Informatics, the Department of Physics, the Department of Biotechnology, the Faculty of Civil Engineering, the Faculty of Humanities and Social Sciences and the Faculty of Engineering.

CONCLUSIONS OF THE EXPERT PANEL

Despite its small size, the Department of Mathematics covers a wide section of its subject area. The self-evaluation report was extremely well formulated and presented with a critical and candid analysis. The site visit provided an excellent insight into the operations of the Department at all levels.

ADVANTAGES OF THE INSTITUTION

The Department of Mathematics of the University of Rijeka is a newly established entity, within the integrated structure of the University. As such it has had the advantage

1. Autonomy to design and initiate a new and novel course provision at undergraduate and graduate level;
2. State of the art facilities for teaching provision;
3. An existent track record of high level research output;
4. Offering of taught courses at undergraduate and graduate levels and being part of national PhD programme in Mathematics;
5. The Department is sole provider for the regional catchment area, and in some cases nationally;
6. Entry into the EU has provided excellent guidance as international benchmarks for quality assurance in education provision and other operational procedures, and the Institution has been flexible in adopting these, aided by its size and youth.

DISADVANTAGES OF THE INSTITUTION

Given the early stage of development of the Department, it is difficult to establish a status quo for financial planning, staffing, student numbers, etc. particularly in recent times of economic recession. The self-evaluation is overall positive, but a number of recurring themes relate to financial issues and consequent impact on budget, staffing and further developments.

1. The size of the Department, including student numbers and staffing, is limited by its relatively small catchment area.
2. Mathematics is a broad subject area and it is difficult to cover the full, increasingly interdisciplinary, scope.
3. Mathematics is, rightly, taught as a basic science for many other subject areas and degrees leading to further demand on resources.

FEATURES OF GOOD PRACTICE

The self-evaluation document describes many excellent examples of Good Practice under all headings, some of which are University based and others are specific to the Department. These include:

1. The comprehensive course offerings at the undergraduate, graduate, and postgraduate levels;
2. The targeting of teaching as an employment destination and the placement of teaching strands in schools.
3. The participation in a national collaborative doctoral programme in mathematics with other Croatian Universities. This is a modern requirement for all and essential for small departments such as this one.
4. Provision of life long learning programmes in science and mathematics for primary school teachers.
5. There is clearly an excellent collegial spirit among the motivated and dedicated members of staff, despite the high workload, with flexible and fair distribution of work, and a genuine impression of commonality of goals across all levels of staff;
6. Although numbers are relatively small, good staff/student engagement is evident from the documentation and from our conversations with the various stakeholders.
7. The use of e-learning techniques for teaching mathematics is becoming standard and it is good to see it pursued by the department.
8. The engagement of staff in pedagogical research, in particular as part of the teacher training courses.
9. The departmental staff is collaborating in international scientific research with a number of international partners.
10. The enthusiastic outreach activities to the outside community in order to sell mathematics and its applications, including to kindergarten children.
11. Development of new niche subject areas for teaching and research. This is rather important for small size departments.
12. Staff recruitment procedures, with an obligatory inaugural lecture in front of students and the committee that evaluates them;

RECOMMENDATIONS FOR IMPROVEMENT

1. Management of the Higher Education Institution and Quality Assurance

- The management should consider some form of annual Professional Development Plan, to be elaborated between the management and individual staff, in the context of the overall Departmental (and University) strategy.

2. Study Programmes

- Attention should be paid to harmonising the format of Learning outcomes, which are at times phrased in terms of thematic specifics and otherwise in terms of more conceptual skills. The English and Croatian versions of the overall documentation should be checked for consistency.
- In terms of curriculum design, advertisement, and counselling, greater engagement with stakeholders is recommended. In particular, the Department alumni relationship could be better exploited in these contexts.
- Learning outcomes of ECTS should provide students with more realistic estimate of workload.
- More placement opportunities for students, in particular for students studying in programmes not related to education of mathematics, should be investigated and these should be flexible in nature from a short to longer periods as necessary.

3. Students

- The Alumni association needs to be better used both to inform developments in the Department and to support past students. In particular, it is useful to help in the recruitment of students or for the provision of placements.

4. Teachers

- There is a good relationship and trust between staff and students resulting in ad hoc problem resolution. With the project growth in staff and students, these interactions need to be documented through formal QA processes.
- The workload model should be reviewed to take into consideration administration, new development efforts, and supervision of research students and projects.

5. Scientific and Professional Activity

- The Department has some niche areas of expertise that could be exploited better to increase the impact and benefit to the wider community but also to generate external revenue for the department. A proactive approach to dealing with local and regional stakeholders is required in order to address their needs.
- The undergraduate and graduate student projects could be used to provide solutions to the local community through collaborative short-term projects and student placements.

6. International Cooperation and Mobility

- The Department has good role models for international collaboration and EU grant awards. A reward and training procedures should be investigated in order to widen the involvement of staff.
- The Department is a member of a number of international associations and they could be better exploited. Researchers should also be encouraged to enrol as potential EU expert reviewers in order to gain further experience in project developments and management. COST actions should be given consideration since they are in general better accessible for a new department.

7. Resources, Administration, Space, Equipment and Finance

- Many of the factors governing resources, in particular human, are hindered by current national policies.
- The University internal funding approach of some research projects could be a good model for addressing some of the shortcomings.

DETAILED ANALYSIS OF INSTITUTIONAL COMPLIANCE TO THE STANDARDS AND CRITERIA FOR RE-ACCREDITATION

In general, the self-evaluation report of the Departmental Team is well presented and addresses in some detail all the re-accreditation criteria.

In terms of classification under the designated assessment criteria, the degree of implementation has been influenced by both national restrictions, e.g. staff recruitment and progression, and by the spread of expertise of the department's staff and other external factors relating to industry and the wider community.

1. Institutional management and quality assurance

- 1.1 The evaluation team felt that the Department has well developed mechanisms and structures that are aligned completely with the University strategic goals and plans as well as the management of quality control and accountability requirements.
- 1.2 The organisational structure of the Department is effective and meets fully the legal requirements.
- 1.3 N/A
- 1.4 The study programmes are in line with the University and Departmental mission.
- 1.5 The Department has well developed quality procedures to ensure that institutional requirements are met. There is evidence of data collection and analysis that are effectively used for quality enhancement. However, these could benefit from the involvement of a wider range of expertise. Advice and involvement of alumni and further community stakeholders need to be expanded.
- 1.6 The mechanisms for monitoring teaching quality are by and large well met through the teacher training requirements. There is a need for further strengthening of the feedback mechanisms and in particular the input from the students.
- 1.7 There is evidence of monitoring research activity. The mechanisms for improving the research quality need reviewing in order to increase and support further developments.
- 1.8 The Department is governed by the University principles and processes of ethical practice.

2. Study programmes

- 2.1 There is evidence of a Quality Assurance structure and in some cases well-documented examples of a review process for enhancement. The use of feedback from stakeholders in the public sectors, private industry and students seem to be lacking. Its strengthening is important for any modern university or department in order to meet its civic and society *raison d'être*.
- 2.2 The enrolment quotas are well understood and meet the society in the teacher training parts of the course, but more labour market analysis is needed for other specialisms.
- 2.3 The enrolment quotas are broadly in line with the institutional requirements for quality teaching and pass rates.
- 2.4 The course description does define well the learning outcomes and the skills levels needed to complete the study programme.

- 2.5 The provided documentation does demonstrate that the learning outcomes are being properly assessed.
- 2.6 The allocation of ECTS is being implemented and may need further refinements. Student feedback seems to imply that the courses' demands are more than the allocated study time and this needs further study.
- 2.7 The programme content is generally in line with international standards.
- 2.8 The teaching methods employed are appropriate for the subject. The experience from training teachers has a positive effect on teaching.
- 2.9 It was noted that subscriptions to E-journals have been cut back on a national level. Mathematics teaching is changing through the use of software packages such as MAPLE and e-learning tools. Familiarity with some of the proprietary tools for symbolic and numeric computation is expected in industry. The non-availability of these proprietary tools is likely to adversely affect the teaching of mathematics as well as the assessment of the student's acquired skills by the market.
- 2.10 The courses aiming to develop pedagogical skills have excellent opportunities for onsite training in schools. Other courses do not seem to have as many opportunities for practical training. It is important that links are developed with the local stakeholders in order to generate practical case studies and internships for the latter.

3. Students

- 3.1 The teacher training courses are well aligned with the future careers. The admission criteria are on the whole are well defined. However, the data on the correlation of a grade in State Matura with later academic success is less well understood and needs further consideration to be successfully applied as an admission criterion.
- 3.2 The new campus will be an improvement for extra curricular activities. However, current students would like to see improvements in other parts of the campus and in particular targeted to their own needs, e.g. an establishment of a student managed common room.
- 3.3 The relationship between students and academic staff is very good as shown by the many cited examples in the submission document and in discussion with students and academics. This close informal relationship needs strengthening by formal documented mentoring and career advice as opposed to the current ad hoc approach as required.
- 3.4 The knowledge assessment processes work well and the students are satisfied. The size of the department and the cohesive environment do help.

- 3.5 There is evidence of formal and informal communication between the HEI and its former students. The HEI is to be complemented to the well structured management of the relationship with the alumni community. However, this close relationship should be exploited further to facilitate internships and course advice developments outside the teacher training courses.
- 3.6 The department has very good initiatives of outreach to the community. A good example was that of a link to a kindergarten but also stretching over all levels of educational institutions. This is to be applauded as the love of mathematics needs to be nurtured early.
- 3.7 The close-knit community feel in the department does engender cross communication and there is evidence of that from the students. It needs to be extended further to the Alumni community.
- 3.8 As stated above there is close collaboration between students and teachers which facilitates the provision of feedback to the students.

4. Teachers

- 4.1. The continued freeze on the national level on recruitment and promotion of academics is hampering the meeting of the University and Department strategic needs. A continuation of the policy will have further adverse effects on the national science base.
- 4.2. As 4.1
- 4.3. The department has a policy for workload distribution and on the whole it works well across the whole spectrum of staff and duties. Further considerations of time allowances should be considered for efforts spent on the development of new courses, international collaboration, and in particular research initiatives that are perhaps not well supported in the present framework.
- 4.4 The department supports the professional development of its scientific-teaching staff well within its resources constraints, in particular for the teacher training courses. The latter may be due to its original mission. This support would need to be offered to new developments.
- 4.5 The staff workload is comparatively high, but its distribution is seen as fair by all staff. However, as mentioned in 4.3 additional tasks such as administrative workload, new developments' efforts, mentoring and student counselling, and PhD supervision are not taken into account in the workload model. Ideally, these extra tasks need to be factored

into these workloads as they may affect adversely research efforts and new developments.

4.6 There is no evidence of external activities affecting adversely the delivery of teaching.

5. Scientific and professional activity

5.1 The Department has an established strategy for the development of research. These are divided into 3 divisions namely, Algebra and Number Theory, Discrete Mathematics, and Mathematical Analysis. Each division has developed a plan for the next 5 years. The targets are clear. However, the mechanisms for performance monitoring need further considerations.

5.2 The divisions are at different levels of development and the research goals are clearly being achieved in some of the more successful sections, such as the Discrete Mathematics Division, through competitive grant awards. The collaboration for a doctoral programme with other Croatian Institutions is to be applauded. This type of collaboration is very important as the department, whilst growing, is still very small by international standards. These successful initiatives need to be encouraged and supported for the wider department.

5.3 The Department has some highly capable researchers at a national level and there is evidence that good international links are being developed and maintained in some divisions to provide potential for further growth of research activities. There is a number of promising staff that should be upgraded by the University in order to create a critical mass in this subject area for both supporting the Postgraduate programmes and for further developments.

5.4 The quality of the scientific papers is good. The department is encouraged to extend this good practice to some of the less productive areas. The productivity is comparable to some other Croatia institutions and it is the department's goal to increase the ratio by staff member. However, the growth and quality is being affected by the non-progression of the junior staff as limited by the policy on national level.

5.5 Career Progression is implemented on a National level and thus is not relevant on a Departmental scale. Recruitment and progression in academic positions is the responsibility of the Department, and is based on excellence and scientific productivity. There is evidence that the department informally supports further scientific activities of its members (e.g. by internally adapting the teaching load to research effort). However, structuring these commendable practices from a personal level in a formalized protocol on a departmental level might enable members to more readily and more frequently apply for dedicated extra research time.

5.6 See 5.4

- 5.7 National and International collaboration leading to publications, whilst very good in some divisions, it is less well developed in others. Internationally funded collaborative projects are less well developed, but the department has good prospects and experience should be exploited further.
- 5.8 The culture of research and industrial collaboration with industry and the public sector is not well developed and needs further support and fostering.
- 5.9 There was no clear evidence of the practice of making additional earnings outside of core activities. However, there is potential for some of the subject areas to generate revenue for the department and new structures should be put in place to support these activities.
- 5.10 The Department does participate in a collaborative doctoral programme with other Croatian institutions. While maintaining this effort, it would be very beneficial if this experience is further extended to the creation of an interdisciplinary Graduate Programme of the University of Rijeka, possibly integrated with other constituents of the University (e.g. Physics, Informatics, Biotechnology).

6. International cooperation and mobility

- 6.1 The Department has a number of agreements with external partners which is to be valued. The Department has expressed disappointment in not attracting external students. In addition, they have had very little success in sending their own students abroad. Information and other measures to facilitate exchange are provided to the students. This goal needs to have role models to succeed.
- 6.2 As mentioned above, there is some support, but no real uptake of students from abroad so far. A review of course offerings that are more appealing to external students may help the situation. For example, English or German classes in new and exciting research areas.
- 6.3 There are well-established international collaborations and this is to be appreciated. However, these are mostly through individual efforts. The Department, despite its shortage in academic staff members, needs to facilitate further the mobility of its teachers and researchers.
- 6.4 As mentioned in 6.3, there are some strong research collaborations and the Department belongs to a number scientific associations. The latter do not appear to be as successfully exploited as the research collaborations.
- 6.5 The opportunity for external students to take courses in English is available every year. There has been no requirement to date. As mentioned in 6.2, staff need to be proactive

and a strategy to take advantage of these opportunities need to be implemented and monitored.

- 6.6 The Department has some successful research groupings that would appeal to external researchers. The University environment and city would also appeal to external colleagues and they have had some academic visitors. As in 6.5 much more is needed to be successful in this very competitive world. Again, the possibility of teaching in English would increase the appeal, of planning for a longer visit, to external academic visitors.
- 6.7 The Department has had a number of successful external collaborations with outside organisations in Europe and elsewhere. The size of the Department does limit somewhat the number of collaborations. However, the future possible increase in staffing would help increase the success rate. The suggested changes mentioned earlier would also help this goal.

7. Resources: administration, space, equipment and finances

- 7.1 The Department is well resourced and the library has adequate material for learning and teaching in the mathematics subject areas. There is a need for further investment in new software packages such as MAPLE as mentioned in section 2.9. The provision of e-journal access needs further consideration in particular for research support.
- 7.2 The support services and their staffing are mostly shared with other departments and the University and the whole this seems to provide adequate help and support for tasks such as a legal and generic IT support. The increase in academic staff and further requirements for research and international collaboration would need further administrative support.
- 7.3 There is clear evidence that the Department has well functioning policies and practices that ensures the professional development of non-teaching staff.
- 7.4 Laboratory equipment does meet the need of staff and are appropriate for the subject area.
- 7.5 Currently the Departmental needs in computer technology are met. However, the proposed increase in research activity, international collaboration, and expansion of the graduate programmes necessitate the deployment of more computer systems to meet the standards in service that are commensurate with this increased level of activity.
- 7.6 The central library facilities are considered adequate for the present, but the e-journal access are more limited and should be reviewed in order to meet the higher projected research and teaching activity.

- 7.7 The Department has been quite successful in meeting the national and international agenda for research collaboration and in particular through the provision of master and PhD programmes. Future consolidation and growth of these activities require further funding and some autonomy and flexibility in its management.
- 7.8 The Department has limited own funds. In addition, its external earnings have been insufficient to help sustain increased research and teaching activity. The Department does recognise the need to increase income from external sources and this is to be encouraged in order to achieve growth and enhance its reputation.