



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

**Date of the site visit:
April 14th 2015**

June 2015

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INTRODUCTION

This report on the re-accreditation of the Department of Physics 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 Hugh J. Byrne, *FOCAS Institute, Dublin Institute of Technology* – panel chair
- Professor Madjid Merabti, *School of Computing & Mathematical Sciences at Liverpool John Moores University*
- 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 Physics 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 Physics, University of Rijeka

ADDRESS: Ulica Radmile Matejčić 2, 51000 Rijeka

NAME OF THE HEAD OF HIGHER EDUCATION INSTITUTION/DEPARTMENT: Assoc. Prof. Rajka Jurdana-Šepić, Ph.D.

ORGANISATIONAL STRUCTURE:

The Head of the Department represents the Department and is its leader and manager.

The Department of Physics is managed by the Department Council. The Council includes all employees of the scientific and teaching staff as well as of teaching staff, two representatives of the associate staff, and student representatives who make up at least 15% of the total number of Council members.

The Department Collegium is an advisory body which includes Head of the Department, Deputy and Heads of Divisions, but can be convened in an extended composition if necessary.

Department is divided into two Divisions:

1. Division of Experimental and Applied Physics, which consists of 4 laboratories:
 - Laboratory for Elemental Microanalysis
 - Laboratory for Quantum and Nonlinear Optics
 - Laboratory for Surface and Materials Science
 - Laboratory for Synthesis of Functional Materials
2. Division of Theoretical Physics and Astrophysics

LIST OF STUDY PROGRAMMES:

Undergraduate study programs	
Study program	Specialization
Physics	
	Mathematics
	Informatics
	Philosophy
	Enviromental Science
	Physics
Graduate study programs	
Study program	Specialization
Physics and Mathematics	
Physics and Informatics	
Physics and Philosophy	
Engineering and Physics of Materials	
Physics	
	Atomic and Molecular Physics
	Solid State Physics
	Astrophysics and Elementary Particle Physics
	Physics and Enviromental Science

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

Academic year 2013/2014

Study programme	Full-time	Part-time
Undergraduate Study Programme in Physics	75	0
Graduate Study Programme in Physics	3	0
Graduate Study Programme in Physics and Mathematics	3	0
Graduate Study Programme in Physics and Informatics	0	0
Graduate Study Programme in Physics and Philosophy	0	0
Graduate Study Programme in Engineering and Physics of	5	0
Graduate Study Programme in Physics and Mathematics (old)	5	0
Total	91	0

NUMBER OF TEACHERS: Full-time – 15 (source Self-evaluation, page 59, Table 4.1.)

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

- Dr.sc.(PhD) - 17 employees
- Mr.sc. – 1 employee

TOTAL BUDGET in 2013 (in kunas):

TOTAL INCOME (A)	5.772.597,84
TOTAL EXPENSES (B)	6.064.504,08
Balance from previous year (C)	420.426,02
TOTAL BALANCE (A-B+C)	128.519,78

MSES FUNDING (percentage): 97, 5% of total income (5.629.136,32 kn)

OWN FUNDING (percentage): 0%

SHORT DESCRIPTION OF HIGHER EDUCATION INSTITUTION:

The Department of Physics, University of Rijeka is relatively recently established (2008), although it derives from the previous Department of Physics of the Faculty of Humanities and Social Sciences. Today Department is one of the four University departments established by the University of Rijeka, as the first phase of the functional integration of the University.

As a University Department, the Department of Physics is a scientific and educational constituent of the University, which participates in the organisation and implementation of the study programmes and develops scientific, artistic and professional work in a scientific field or an interdisciplinary field, and organises studies in its domain.

Department relocated into the new building of the University Departments at the Campus in September of 2012. Members of the Department of Physics also share facilities of the Centre for Micro and Nano Sciences and Technologies at the University (2014).

CONCLUSIONS OF THE EXPERT PANEL

The Department of Physics is a relatively small department with established expertise in some areas, and emerging expertise in others.

The self evaluation report was extremely well formulated and presented, and the site visit provided an excellent insight into the operations of the department at all levels.

ADVANTAGES OF THE INSTITUTION

The Department of Physics 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 and laboratory support,
3. State of the art facilities for graduate projects and research,
4. An existant track record of high level research output.
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 etc.

The Department has recently diversified from its traditional expertise in theoretical and astrophysics into Materials and Environmental Science. While this is wholly appropriate, it is difficult to assess the impact at this point in time.

1. The size of the Department, including student numbers and staffing, is limited by its relatively small catchment area.
2. Physics itself is a broad subject area and intrinsically it is difficult to cover the full, increasingly interdisciplinary scope. Overspecialisation is, however, also not appropriate.
3. Physics is also a basis for a broad range of sciences and engineering, and so a substantial amount of service level teaching is the norm, and can further stretch resources.
4. Academic credibility often is gauged by 3rd level (doctorate level) education and research. Doctoral Programmes are not yet well established nationally, but they are difficult to establish with any scale.

FEATURES OF GOOD PRACTICE

The self evaluation describes many excellent examples of Good Practice under all headings. These include:

1. The multidisciplinary scope of the the undergraduate and graduate course provision
2. The targeting of teaching as an employment destination
3. The placement of teaching strand students in schools
4. Provision of life long learning programmes
5. Foundation Study Programme for Acquiring the Knowledge, Skills and Ability Necessary for Enrolling in the Graduate Study Programme in Engineering and Physics
6. Although numbers are small, good staff/student engagement is evident
7. The use of e-learning techniques
8. The engagement of staff in pedagogical research
9. The engagement of staff in international scientific research
10. Staff recruitment procedures; obligatory inaugural lecture in front of students and the committee that evaluates them
11. Staff recruitment procedures; Master of Education in Mathematics and Physics

RECOMMENDATIONS FOR IMPROVEMENT

1. Management of the Higher Education Institution and Quality Assurance

- There is clearly an excellent collegial spirit amongst staff and between staff and students. The management appeared to be well respected and there was a genuine impression of commonality of goal across all levels of staff. In terms of more formally monitoring continued professional development of staff, however, the management could 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. A better understanding of this QA tool will help staff and students in, for example, assessing workloads and ECTs accreditation.
- In terms of curriculum design, advertisement, and counselling, greater engagement with stakeholders is recommended. In particular, the Department alumni could be better exploited in these contexts.
- The department has more recently diversified into areas of Materials and Environmental Sciences. While it is difficult to establish a niche in these general areas, engagement with local industry could be important in sustaining investment, as well as guiding curriculum design and providing relevant placement for students.

- In both the more traditional and emerging areas, the development of Doctoral Programmes should be considered a priority. It is important that the Department and University gain credit (academic and financial) for such a programme, however, and partnering with larger Universities may not be the best option. An interdisciplinary Doctoral Programme, which would integrate the divisions of the Department, and partner with other autonomous (non Faculty) Departments of the University may be the best option.

3. Students

- The Department could support a student Physical Society, and additional extra curricular events such as presentations from Alumni and other local stakeholders.

4. Teachers

- In the transition to full implementation of QA practices, the department staff should be more rigorous in documenting and formalising practices which, understandably in a small department, are considered daily practice. This includes, for example feedback from students.

5. Scientific and Professional Activity

- In both Divisions, it could be important to generate critical mass by consolidating into self – sustaining groups. A vehicle for shaping this could be the Doctoral programme.
The considerable investment in state of the art research facilities in this area promises to provide a platform for significant advancement of international and industrial collaborations, raising the profile of the Department and opening routes for inward mobility of staff and students.
- The facilities are, however, costly to sustain, and a Sustainability Plan, including academic and non academic access costs, annual service costs, dedicated technical support, should be established.

6. International Cooperation and Mobility

- In general, it may take time to build up an international profile. Engagement in the EU is critical. COST actions are relatively easy to access.
- Researchers should be encouraged to enrol as potential EU Expert reviewers. This can give an insight into the workings of the granting process.

7. Resources, Administration, Space, Equipment and Finance

- Many of the factors governing resources are hindered by current national policies. Importantly, EU and other such projects also come at a cost, and do not generate additional funds. Engagement with local industry is a potential generator of revenue, but a clear cost model should be developed.

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 manner 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 between established areas and emerging areas.

1. Institutional management and quality assurance

- 1.1 The evaluation team felt that the Department could be more rigorous in its procedures for documenting quality assurance tools such as student feedback and impact on course design and assessment.
- 1.2 The organisational structure of the Department is well formulated and formalised.
- 1.3 N/A
- 1.4 The study programmes are in line with the University and Departmental mission
- 1.5 The Department has performed well in the implementation of QA procedures to the range of course programmes and scientific activities. It has considerable experience in the more traditional areas of theoretical and astrophysics, but has more recently expanded its programmes and research into Materials and Environmental Science. As these activities are new, a full assessment of impact has not been possible. A concerted engagement with strategic stakeholders is recommended.
- 1.6 As 1.5. Engagement with Stakeholders is essential to assess market need.
- 1.7 As 1.5. Sustainability of significant investment in research facilities will require careful resourcing and engagement with stakeholders, locally and internationally.
- 1.8 The Department is governed by the University principles and processes of ethical practice.

2. Study programmes

- 2.1 Although the Department has implemented appropriate QA procedures, engagement and feedback from students, and its impact on development of programmes should be more rigorously documented. Engagement with other stakeholders, including alumni, private and public sectors should be increased, the latter particularly in the newer areas of Materials and Environmental Sciences.

- 2.2 As 2.1, in the areas of more recent programme development, engagement with local private and public societies should be increased.
- 2.3 As 2.1, while the recent diversification of the study programmes is a positive, the demand for the newer areas of Materials and Environmental Sciences and the impact on staffing resources should be carefully monitored
- 2.4 The description of Learning Outcomes and the match to ECTs workload is not well harmonised across all study programmes. It is important that these are harmonised, and in doing so the usefulness of these QA tools can be better appreciated by staff and students alike.
- 2.5 As 2.4
- 2.6 In addition to comments in 2.4, the increasing impact of e-learning vehicles on workload should be monitored.
- 2.7 The programme content is generally in line with international standards. In some instances, the panel noted inconsistencies in the prerequisite requirements for students in dual courses. Also, the availability and range of Elective modules should be reviewed, although this may be largely a timetabling issue. Learning outcomes should be refined and harmonised.
- 2.8 The teaching methods employed are appropriate for the subject, including laboratory and classroom based training, and encourage student self learning through assignments and e-learning.
- 2.9 It was noted that subscriptions to E-journals have been cut back on a national level. This will have a negative impact on the higher level programmes and research activities. It was also noted that access to text books is limited.
- 2.10 In the teacher training programmes, the access to practical training in schools is excellent.
In the more recently developed programmes, increased engagement with local industry is required to develop the possibility of training internships.
In the context of practical experience, learning outcomes should be refined.

3. Students

- 3.1 Although it is possible to align entrance levels with career expectations in the more established programmes, it has not yet been possible for the newer programmes in Materials and Environmental Science.
- 3.2 Extracurricular activities on the new campus are in general being developed, and should be supported by new sports and recreational facilities.

It was suggested that the Department could support a students Physical Society, and additional extra curricular events such as presentations from Alumni and other local stake holders.

- 3.3 It is understandable that in a small department, mentorship is largely informal. The Department could however consider a more integrated approach to using alumni to provide professional guidance.
- 3.4 More formal procedures of assessment feedback to students should be considered.
- 3.5 In general the panel felt that the Department could do considerably more in terms of exploiting the resource of alumni, in terms of course development, advertisement (e.g. "where are they now?" type testimonials on the website) and student counselling.
- 3.6 The department has a good profile of public engagement, but could increase efforts. The role of the Physicist in the community is not always easy to explain, but perhaps exploiting alumni in this role could be beneficial.
- 3.7 Students are engaged in the management structures of the Department, and are given opportunities to influence the decision making processes of the Department.
- 3.8 Feedback is provided through the organisational structures of the Department.

4. Teachers

- 4.1 Development of the Departmental activities has been hampered by the state embargo on recruitment and progression.
- 4.2 As 4.1
- 4.3 The Department delivers and supports a range of programmes, both for its own students and students from across the range of university constituents, and the calculation of the staff student ratio is therefore very varied (1:5 for own 1:63 for all).
Staff student numbers in the established courses is satisfactory, but uptake to the more recently developed courses is low and demand should be monitored.
The development of a Postgraduate Doctoral Programme, in line with the University Strategy is recommended, but the impact of the additional burden of doctoral mentoring on staff workload needs to be considered.
- 4.4 In general, the department encourages staff development to enhance the mission.
- 4.5 In general, the feedback from the staff across the spectrum of the department was that the workload was high, but distribution was fair. Continued efforts to improve on recruitment and progression need to be maintained.

- 4.6 There is no significant impact of external commitments on teaching and research activities. Nevertheless, there are documented procedures for monitoring this.

5. Scientific and professional activity

- 5.1 The Department has an established research profile in the areas of Theoretical and AstroPhysics, although it is somewhat fragmented and based on the performance of individuals. Consolidation in groups should be considered.
In the developing areas of Materials and Environmental Science, substantial investment has been made in recent years. A sustainability plan, including costing of equipment access, maintenance, technical support needs to be established. Engagement of local industry is essential in this context.
An intergrated Doctoral programme, potentially with other constituencies of Uni Rijeka, should be considered.
- 5.2 In the established areas, national and international collaboration is well developed. In the emerging areas, this is currently in development.
For the future integrity of the Department, it may be important to consider interactions between the two Divisions to avoid fragmentation. A Doctoral Programme may be an appropriate vehicle.
- 5.3 The Department has a good profile of research staff at professor level, but to develop a more vibrant level of activity in both divisions, great numbers of Doctoral and Postdoctoral researchers are required. This could be realised in part through the development of a Doctoral Programme.
- 5.4 The research publication profile of the Deptment is good, in the established areas of Theoretical and Astro Physics, although the outputs are fragmented in that they largely derive from individual staff members.
The new research facilities should provide an excellent platform for global contributions to the field, although it is too early to tell.
- 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.
- 5.6 As 5.4
- 5.7 The research profile of the Deptment is good, in the established areas of Theoretical and Astro Physics, although the outputs are fragmented in that they largely derive from individual staff members.
The new research facilities should provide an excellent platform for global contributions to the field, although it is too early to tell.
- 5.8 The new research facilities should provide an excellent platform for engagement with industry and EU. Initial engagement has been undertaken.

- 5.9 Staff are generally supported in their engagement in professional activities, although there have been few additional earnings to date.
The new research facilities will require careful resource planning.
- 5.10 The Department does not provide a Doctoral programme, although it does engage junior researchers engaged in postgraduate education in Zagreb.
The panel recommends that the Department should consider the development of a Doctoral Programme of the University of Rijeka, possible integrated with other constituents of the University (e.g. Mathematics, Informatics, Biotechnology). In time, such a programme could be very important for the future development, profile and credibility of the Department.

6. International cooperation and mobility

- 6.1 The Department has in place several Erasmus agreements and encourages mobility of students. The students were well informed of the opportunities.
- 6.2 Erasmus opportunities are available to students, but there has been little uptake to date.
- 6.3 Within a research context, there are well established international relationships which facilitate mobility in the more established areas of Theoretical and Astro physics. Such relationships are less well established in the developing areas of Materials and Environmental sciences, although the recent investment in state of the art facilities should provide a solid platform for the expansion of international collaboration.
- 6.4 As 6.3: There are well established relationships with international associations in the more established areas of Theoretical and Astro physics. Such relationships are less well established in the developing areas of Materials and Environmental sciences, although the recent investment in state of the art facilities should provide a solid platform for the expansion of international collaboration.
- 6.5 Study programmes are available in English if required, although no visiting students have been hosted to date.
The Centre for Micro and Nano Sciences and Technologies is an ideal platform from which to build international collaborations, potentially through a doctoral programme. Consolidation of this facility of international standing could act as promotion for students at the graduate and undergraduate stage.
- 6.6 The Department has modern facilities and an attractive working environment.
It has established expertise in Theoretical and Astrophysics and emerging capacity in Materials and Environmental Sciences. Key to attracting international staff is the establishment of a Doctoral Programme, which will help establish a vibrant research environment and local module delivery at the highest level.

- 6.7 Although the Department has established interinstitutional relationships in some areas, including an international Erasmus student exchange programme, significant further development in this could be achieved.
In the current diversification of themes, it is important that the department itself does not fragment.
It considering a Doctoral Programme, the Department should consider an interdisciplinary platform within the University of Rijeka, rather than with larger Universities, which could dominate.
Internationally, vehicles such as COST, and even engagement of staff as EU expert evaluators could be considered.

7. Resources: administration, space, equipment and finances

- 7.1 The Department is well resourced within the new campus.
It was noted that demonstration equipment in the early stage undergraduate laboratories was somewhat dated.
The lack of E-journals is of concern for later stage programmes and research development.
The central library facilities are considered adequate, but stocks of books can always be improved.
- 7.2 Non teaching staff include technical and administrative support.
One administrator for the department is not adequate, and most staff have to carry out a significant amount of administrative duties.
Undergraduate and graduate laboratories are well provided by technical support.
In the future development of sustainable research and Doctoral activities, consideration should be given to dedicated technical support for the Centre of Micro and Nano S&T.
- 7.3 The Department encourages professional development of non teaching staff and there is clear evidence that they have availed of such opportunities.
- 7.4 Laboratory equipment is of recognised international standard, and usage is supervised and monitored by well qualified technical support staff.
- 7.5 The facilities across the department are of a very high quality, in line with international standards.
It was noted, however, that demonstration equipment in the early stage undergraduate laboratories was somewhat dated.
- 7.6 The central library facilities are considered adequate, but stocks of books can always be improved.
The lack of E-journals is of concern for later stage programmes and research development.

7.7 The Department is in the process of undergoing a period of rapid evolution and diversification. As funding is at present largely derived from the state, it is important that cost evaluations are closely monitored.

Important is:

An evaluation of the viability of the recently developed courses.

A sustainability plan for the newly acquired research facilities of the Centre.

The development of a Doctoral programme, which will in turn have impact on the staff workload.

7.8 To date, the Department has not had a strong record in earning its own funding. In so far as possible, it has continued to use its own funds to develop the facilities and activities of the Department.

The establishment of the Centre is a substantial and significant investment, which can help establish a platform for engagement with local industry, international collaborations, and the establishment of a Doctoral programme.

Such facilities are, however, very costly to maintain and sustain, and careful consideration should be given to a cost recovery plan.