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ALBANIAN UNIVERSITIES COOPERATION AND SYNTONIZATION OF TEACHING PROGRAMS
BASHKËPUNIMI I UNIVERSITETEVE SHQIPTARE DHE SINTONIZIMI I PROGRAMEVE MËSIMORË

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PËRMBLEDHJE
Në universitet publike në Shqipëri ku realizohet formimi i studenteve në drejtime të afërsisht te njëjta, vihen re diferenca jo të vogla në planet mësimorë, në njohuritë shkencore që jepen dhe në nivelin e trajtimit të tyre. Duke u bazuar edhe në eksperiencat e disa vendeve europiane, është e udhës që studimet universitare tre vjeçare (Bachelor) në shkencat natyrore, e veçanërisht në fizikë, të realizohen me plane dhe programe mësimore të sintonizuara, të cilat u japin studenteve njohuri shkencore të përafërta dhe të krahasueshme. Fizika si dhe shkencat e tjera natyrore janë disiplina qe kërkojnë paraqitje sistematike si dhe nxënie të strukturuar të njohurive duke realizuar një lidhje harmonike ndërmjet teorisë dhe eksperimentit. Hartimi dhe zbatimi i programeve mësimore të sintonizuara, veçanërisht në të gjitha universitet publike të trevave shqipfolëse, do të mundësojë zbatimin real të Procesit të Bolonjës në universitetet shqiptare.
Fjalët kyçe: arsimi i lartë, Bolonja, fizika, programet mësimorë

SUMMARY
In public universities of Albania for students studying in roughly identical disciplines are noted remarkable differences in the educational plans, in scientific knowledge provided as well as in the level of treatment. Based on some European countries' experiences, we propose three year studies curricula (Bachelor) in natural sciences, and especially in physics, be covered by syntonized educational plans and programs, which offer to the students similar and comparable scientific knowledge. Physics, as well as other natural sciences, are disciplines requiring systematic presentation and structured learning method, ensuring a harmonic relation of theory and experience (experiment). The compilation and application of syntonized educational plans, especially by all public universities of Albanian-speaking lands, will put really in practice Bologna Process requirements in Albanian universities.
Key words: Bologna process, higher education, physics, teaching programs

INTRODUCTION

The structure and content of the higher schools and universities in Albania, Kosova and Macedonia presents a fragmentary pattern, owing to the historical specificities of each country. In the framework of European integration, a reflection and reform in the domain of higher education is also becoming necessary, in order to achieve it on the basis of an inter-Albanian integration.

The Bologna Process has been intended to open the borders inside European continent and make it easier for European students to study and work in different European countries. Educational standards in each European country have to be comparable or similar, so that student's transfers

between universities and educational institutions would be achieved much easier.

In signing the agreement of the Bologna Process all the countries, including Albania, become member of the European Higher Education Area (EHEA), and their common goal is to make it easier for students to move within the area for study and work purposes. By 2010 all the countries signing the agreement ought to have reached the goals of the Bologna declaration, through the adaptation of the common terminology and standards agreed upon.

The system of higher education in these countries will follow common guidelines including a three cycle system of higher education; Bachelor degrees (180-240 ECTS credits), Master degrees (90-120 ECTS credits) and Doctoral degrees.

In the framework of European integration of Albania, Kosova and Macedonia, it is the moment of the common evaluation, assessment and action in the area of higher education, in order to improve the structure, content and performance of Albanian speaking universities.

Albania's public universities, while dispose many opportunities and different directions for student education, we evaluate manifest in the same direction / area of formation, differences and even discrepancies in educational plans, in the scientific knowledge delivered and also in the level of their treatment, and we are obliged by the hard evidence of a very low rate of graduate employment in Albania nowadays, to highlight the urgent need of repair and compatibility reform.

Based on experiences from several European countries, it is appropriate that in Albanian speaking area the three-year undergraduate studies (Bachelor) in natural sciences, especially in physics be realized with the sintonized teaching plans and tuned curricula, which offer to students a related and comparable scientific knowledge.

European Physical Society (EPS) and other European agencies (1,2) involved in higher education and research, in order to achieve this compatibility, that physics students reach similar level of basic knowledge and practical skills, strongly recommend following and applying the curricula of six broad areas of physics studies.

Department of physics have to be aware of the indicative listing, which broadly specifies the common programme which can be found in most physics degrees across Europe. This listing also aims to represent the level of physics knowledge and skills of physics departments, which generally consider sufficient to admit graduates of other universities to their master programmes without supplementary requirements, except possibly for minor adaptations that do not lead to a net increase in the workload. It is not intended to either provide a fixed and detailed physics syllabus or to replace the national quality assurance systems actually in force in various countries.

MOTIVATION

Most European countries have introduced a Bachelor degree in response to the Bologna agreement and have introduced, or are in the process of introducing Masters' programmes. These countries, at the same time, are either introducing or strengthening national quality assurance mechanisms which are external to the university.

Major changes to the structure of Physics degrees are associated with

- The Bologna agreement
- The introduction of the bachelor/master system
- External quality assurance mechanisms on a national or regional level
- National degree standard.

Quality agencies are mainly concerned with generic competences and the general organisation of university studies (4,5). They are not usually prescriptive at the level of detailed curricula. Recently, EPS issued a document intended to be valid all over Europe. The aims of this document are to provide a Europe wide reference set of standards, to allow for variations in teaching approaches, to specify the physics knowledge required for masters level course in physics, to help mobility both within bachelor degrees and between bachelor and master

degrees, to provide a useful reference point especially for smaller countries and less well known universities.

There have been wide-ranging studies of physics curricula by the European Physics Education Network (EUPEN), and its continuation, the STEPS project. In addition the TUNING project (3,6) has also looked in detail at physics degrees and produced *Reference Points for the Design and Delivery of Degree Programmes in Physics*.

The motivation for this study is to provide a general reference point for Physics degrees, to aid the implementation of the Bologna changes in Albanian public universities and to facilitate co-operation and physics student exchange between all public universities of Albanian-speaking area.

PROPOSAL

Physics is both an experimental and a theoretical discipline that is continuously evolving. It is deeply rooted in the idea that even complex systems can be understood by identifying a few key quantities such as energy and momentum, and the universal principles that govern them. Part of the appeal of physics is that there are relatively few such principles and that these apply throughout science and not just in physics. Curricula will usually distinguish between fundamental ideas and the description and modelling of phenomena. The fundamentals, which all students need to cover to some extent, have to include: mechanics, electromagnetism, quantum physics, thermodynamics, statistical physics, wave phenomena, optics and properties of matter (elementary constituents and their interactions). The application of the fundamental principles to particular areas also includes: atomic physics, nuclear and particle physics, condensed matter physics, physics of materials, physics of fluids etc.

Physics is a hierarchical discipline that requires systematic exposure and ordered as well as structured acquisition of knowledge. It is a subject which relies on experiment and observation as the source of our knowledge of the physical universe. Practical skills have to be developed as also does an appreciation of the link between theory and experiment. In Physics degree the teaching methods may typically include:

- lectures supported by problem classes and group tutorial work;
- laboratory work;
- the use of textbooks and other self-study materials;
- open-ended project work, some of which may be team-based;
- activities devoted to physics-specific development.

Examination and test questions should be graded to assess a student's understanding of concepts and ability to develop, apply and test mathematical models, to perform calculations, to solve new problems, to communicate physical arguments and to assess critically results in their context. Time constrained work has its place in testing the student's capacity to organize work as well as to think and to communicate under pressure.

On the basis of the EUPEN and TUNING studies, six broad areas of physics study have been identified. Five of these are essential for a physics degree and the sixth is provided for optional minor specialisations. This structure is based on a 3 year Bachelor degree, but it could equally cover the first 3 years of an integrated degree or even a 4 year bachelor. The structure of physical Bachelor degree is indicated in the following table. Overall at least 140 of the normally 180 ECTS credits would have to be in physics and mathematics; that is in the first 5 streams. Estimated credit values for each stream are in the range 20-40, with the exception of the optional stream which is 0-40.

In addition to general physics bachelor programme, departments may offer interdisciplinary or specialized bachelor programmes (e.g. aimed at future teachers of physics, often combined with another subject, or at other professional fields).

Stream		ECTS credits
I	**Mechanics & Thermodynamics** Classical mechanics, Thermodynamics and kinetic theory, Special relativity, Advanced classical mechanics, Background to quantum mechanics.	20-40
II	**Optics & Electromagnetism** Oscillations & waves, Basic optics, Electromagnetism, Advanced Electrodynamics and Optics	20-40
III	**Quantum Physics** Quantum mechanics, Statistical mechanics, Solid state physics, Atomic, nuclear and particle physics,	20-40
IV	**Experimental/laboratory** Laboratory work, Project work	20-40
V	**Mathematics & computing** Mathematics, IT skills & Modelling	20-40
VI	**Optional subjects** Minor subjects either related to Physics or totally unrelated. (Chemistry, Electronics, Astronomy & Astrophysics, Medical Physics, Geophysics, Biophysics, Foreign language skills)	0-40

Table 1 Structure of Physics Bachelor degree

A physics bachelor degree should develop some generic competences:

- to solve problems with well-defined solutions and to formulate problems in precise terms and to identify key issues;
- to develop their skills of investigation and to have experience with extracting information from textbooks and other literature;
- to pay attention to detail and to construct logical arguments;
- to develop their computing and IT skills in a variety of ways;
- to develop their ability to work independently, to use their initiative and to interact constructively with other people;
- to have oral and written knowledge of English;
- to evaluate that to fabricate, falsify or misrepresent data or to commit plagiarism constitutes unethical scientific behaviour.

IMPLEMENTATION

Based on Tuning Project and EPS evaluation, we suggest physics departments self-certify their programmes as being consistent with these standards or not, and if not give their reasons. When some subjects cannot be accommodated within the obligatory courses, they might be offered as electives. Similarly, we suggest departments use these standards to specify the knowledge and skills they require for admission to their masters programmes.

The departments of physics of Albanian public universities, during the last years, after the signing of Bologna agreement by Albanian Government, have done every effort to adapt the Bologna system (3 years Bachelor degree + 2 years Master degree) and deliver the necessary knowledge in physics as well as in mathematics, computer science, chemistry. The comparison of educational curricula actually in force, manifests some deviations from the above EPS proposals, where it is noted that credit values in mathematics and computing are in the range of 50 - 60 ECTS credits, much more than 40 credits, and that resulting in the respective decrease of the part reserved to physics. Also the credit values in Laboratory work and Project work are under the 40 ECTS credits.

CONCLUSION

The Bologna Process has been intended to open the borders between European countries and European universities. In the framework of European integration, Albanian universities have to increase their common efforts to create the real possibilities for education and work in Albanian speaking area. It is necessary to cooperate in all the education fields. Physics is only an illustration.

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