A Study Case Regarding the Advanced Education for Optometrist Professionals in Romania

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Abstract: Optometry is becoming more and more interdisciplinary and gives new opportunities for collaborative research due to the accumulative complexity of knowledge and the rapid transformation of the technological capabilities in domains such as information technology, optics, applied engineering, health sciences, and entrepreneurship and management. Therefore, the paper presents a study case of a master organized at the University Politehnica of Bucharest related to the current challenges of optometrist education in Romania. The master program is carried out within the Faculty of Mechanical Engineering and Mechatronics of the University POLITEHNICA of Bucharest, being organized by the Department of Mechatronics and Precision Mechanics.and It falls within the Field of Mechanical Engineering specialization, according to Government decision no. 1609/30.09.2004, published in the Official Gazette of 18.10.2004. Conceived as a continuation of the bachelor's studies, the Advanced Optometry master program ensures the deepening in the field of the Optometry license program. It is an attractive option for the graduates of the Optometry program, accredited for the first time in 2007 and reaccredited in 2011. It ensures the development of scientific research capacities and is a mandatory preparatory basis for doctoral studies.

Keywords: Optometry, Occupation, Education.

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Introduction

The Optometry Field

Nowadays, the optometry field becomes more and more interdisciplinary and gives new opportunities for

collaborative research due to the accumulative complexity of knowledge and the rapid transformation of the technological capabilities (Iskander, 2013) in the domains as information technology, optics, applied engineering, health sciences, and entrepreneurship and management.

The Optometry Occupation

In Romania exists the several occupations related to optometry (Ministry of Labor, 2022) optics. At the level of secondary studies exists a series of technicians with competencies related to lens and spectacles manufacturing as:

- centering and cutting optical parts
- degreaser, parts cleaner, and optical appliances
- optical apparatus fitter
- optical parts treatments specialist

Another occupation has specific competencies in the field of optometry:

- optical technician/optician with competence in optical instruments and devices assembling, repairing, design of the various parts of eyewear such as lenses, and frames. Also, the competencies include cutting, inspecting, mounting, grinding, coating, and polishing all optical parts and lenses using various machinery and hand tools and in the final, they can fit the lenses into eyeglass frames.
- Medical/dispensing opticians- have competencies in optical designing, fitting, and dispensing optical lenses based on a prescription from an ophthalmologist or optometrist for the correction of reduced visual acuity and can do the service for corrective eyeglasses, contact lenses, low-vision aids, and other optical devices.
- Optometrists- have competencies in eyes examination and testing to identify abnormalities, visual problems, or disease, and can prescribe and fit lenses such as spectacles and contacts and offer advice on visual problems.

At the level of higher education are two main occupations:

- optometrist (higher education)
- optical systems engineer/ optometric engineer
- Optomechanical engineer

Optometrists are other specialists in health and can examine and test eyes to identify abnormalities, visual problems, or diseases (Adams, 2007). According to the results, the optometrist can prescribe lenses (for spectacles and contacts lenses) and offer advice on visual problems and may refer patients to a medical practitioner. Optometrist interdisciplinary skills and competencies are accountability, advice on healthcare,

communication, education on the prevention of eye problems, use of e-health and mobile health technologies, use of optical devices, and selling lens or frames.

Optical systems engineers / optometric engineers are specialists who carry out research activities, recommend or develop engineering procedures and solutions regarding workplace safety, biomedical engineering, optics, materials, etc.

The optomechanical engineer can design and develop optical and optomechanical systems, devices, and components by combining optical engineering with mechanical engineering in the design of these systems and devices.

Regarding the level of the payment of an optometrist according with our surveys we can conclude that exist big differences between the employees in the regions of Romania. The average salary in Romania is 144163RON per year (29233Euro per year, taking into account the yearly exchange rate for 2022 of 4.9315lei for 1 Euro). In Bucharest, the capital of Romania, where is concentrated 10% of Romanian population the average salary is 162477 RON per year (32946Euro per year, taking into account the yearly exchange rate for 2022 of 4.9315lei for 1 Euro). In another big city, Brasov with a population of 1 % of Romanian population the average salary is 125390 RON per year (25426Euro per year, taking into account the yearly exchange rate for 2022 of 4.9315lei for 1 Euro). The minimum salary in Romania is 36996RON per year (7502Euro per year) so the optometry represents a good opportunity for the young professionals. The average salary in Romania will increase in 2028 up to 169080RON (34,285Euro per year, taking into account the yearly exchange rate of 4.9315lei for 1 Euro).

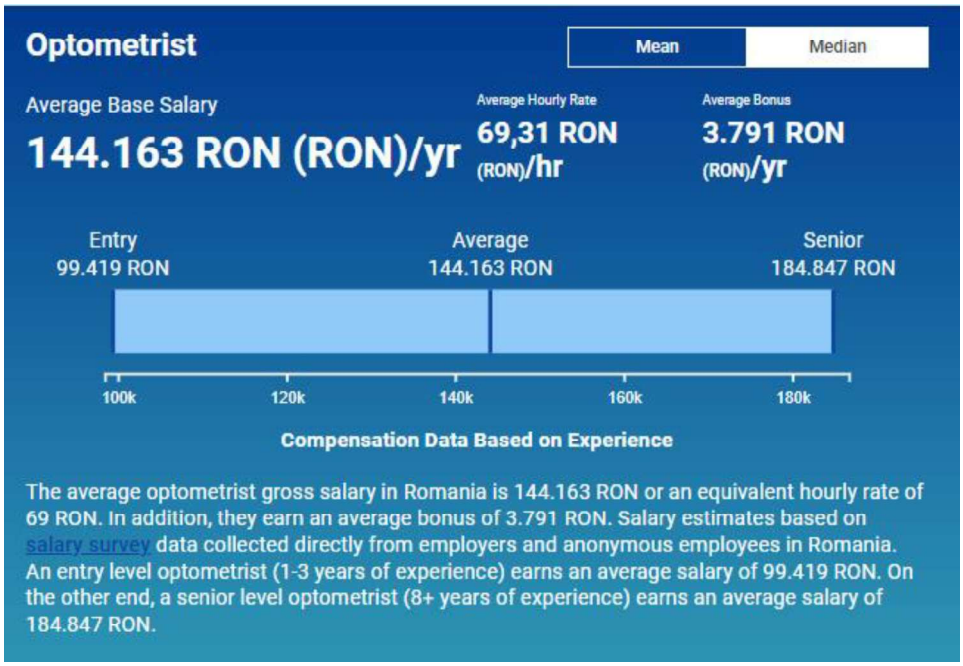

Figure 1. Average salary in Romania

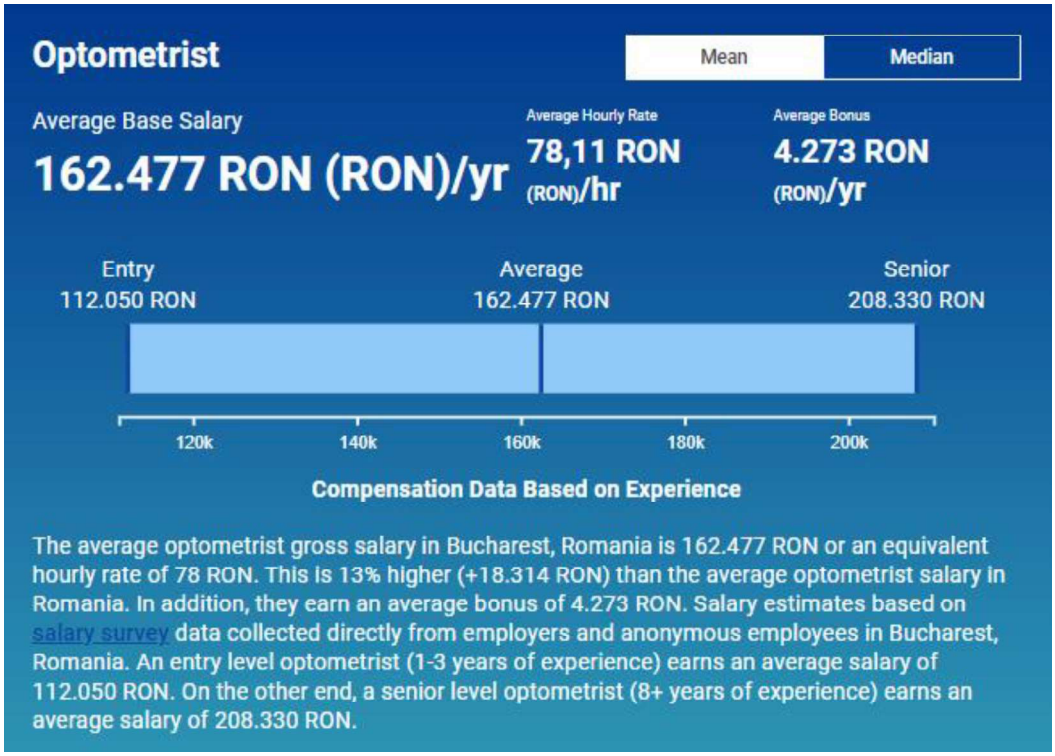

Figure 2. Average salary in Bucharest

Figure 3. Average salary in Brasov

Figure 4. Estimated salary in Romania for 2028

The Optometry Higher Education in Romania

In Romania, the higher programs related to optometry is organized four university centers:

- University Politehnica of Bucharest (Faculty of Mechanical Engineering and Mechatronics, 2022a; Faculty of Mechanical Engineering and Mechatronics, 2022b; Faculty of Mechanical Engineering and Mechatronics, 2022c; National Register of Qualifications in Higher Education, 2022) with Optometry - testing and prescription postgraduate continuous professional training – Optometrist (higher education), Optometry bachelor program for Optometric engineer qualification, and Advanced Optometry master program for Optomechanical engineering consultant qualification.
- University of Craiova (University of Craiova, 2022) with an Optical and Optometry master program for Medical Physics qualification.
- University Transilvania of Brasov (Transilvania University of Brasov, 2022) Optometry bachelor study program for glass and ceramics processing engineer.
- University "Alexandru Ioan Cuza" of Iaşi (Alexandru Ioan Cuza University Iasi, 2022) with an Optics and Optometry master program for Physician.
- Introduction

A Study Case. The Advanced Optometrist Education in University Politehnica of Bucharest

From the previous investigation can be seen that at University Politehnica of Bucharest it's the only place where a Master of Advanced Optometry is given a qualification related to optometry. Therefore, we will have the focus

on this educational program as a study case.

The master program is carried out within the Faculty of Mechanical Engineering and Mechatronics of the University POLITEHNICA of Bucharest, being the responsibility of the Department of Mechatronics and Precision Mechanics. It falls within the Field of Mechanical Engineering specialization, according to Government decision no. 1609/30.09.2004, published in the Official Gazette of 18.10.2004. Conceived as a continuation of the bachelor's studies, the Advanced Optometry master program ensures the deepening in the field of the Optometry license program and is an attractive option for the graduates of the Optometry program, accredited for the first time in 2007 and reaccredited in 2011. It ensures the development of scientific research capacities and is a mandatory preparatory basis for doctoral studies.

The program aims to develop knowledge in the field of optometry, in the direction of training for clinical activity, research and in the sense of opening to new fields, such as behavioral optometry. The field of optometry has experienced from 1994 until 2004 an evolution exclusively at the college level. Starting with 2004, the specialization Education Optometry for 4 years was created within UNIVERSITY POLITEHNICA OF BUCHAREST (such a specialization still exists only at the Transilvania University of Brasov, whose optometry education was created later and with the support of the one from the University Politehnica of Bucharest). At present, the training of optometrist engineers has been recognized including by the introduction by the Ministry of Labor in the new Classification of Occupations in Romania structure of the occupation "Optometrist higher education", included in the same group as the ophthalmologist. In fact, there is a good collaboration between the Optometry specialization from University Politehnica of Bucharest and the Faculty of Medicine, the ophthalmology specialization, including in didactic form (courses and laboratories of anatomy and ocular pathology, etc.).

Through this master, the necessary knowledge will be provided to the optometrists to work in ophthalmology clinics and hospitals for optometric testing problems (a concept already applied at the European level), to participate in the development of optometric equipment (as a partner of the optician engineer) and to support the development of new fields in the area of labor protection and efficiency. Thus, the development of ophthalmology and optometry will be supported at the clinical level or in the case of special categories of patients (elderly patients, patients in post-operative condition, etc.), conditions will be created for the relaunch of the production of ophthalmological equipment as well as for the introduction of modern methods of optimizing the working conditions in support of the specialized personnel. The training through the master's degree entitled Advanced Optometry from the Faculty of Mechanical Engineering and Mechatronics has as its main objective the assurance of theoretical and practical knowledge for the training of a specialist in optometry.

Regarding student admission Until the academic year 2013-2014, 25 places were allocated annually to the Advanced Optometry specialization. They were filled by admission/interview contest, according to the specific procedures of the university [http://www.University Politehnica of Bucharest.ro/admitere-licenta.html]. The situation of filling the seats in the last 5 years is presented in table 1.

Table 4. The statistics regarding the master program.

Admission year	Students	Year of graduation	Graduates	Employees in the field
2013	15	2015	12	12
2014	20	2016	13	13
2015	14	2017	13	13
2016	23	2018	23	23
2017	19	2019	19	19
2018	23	2020	23	23
2020	16	2022	-	-
2021	24	2023	-	-

The higher education institution organizes an admission contest (usually in July and September) based on an exam or aptitude tests, in specially organized sessions, according to the structure of the academic year approved by the University Senate.

University applies a transparent policy of student recruitment and admission, publicly announced at least 6 months before application. Admission is based solely on the academic skills of the candidate and does not apply any discriminatory criteria.

The students from the Advanced Optometry study program are involved in the student scientific research activity, actively participating in the communication sessions, organized annually within the University Politehnica of Bucharest, but also in other events. Starting with the academic year 2016-2017, during the session of student scientific communications was distinctly organized the Optometry session, being held 32 student scientific papers.

The professional competencies are divided into nine fields where six are professional and three are transversal:

C1 Computer-aided modeling of the visual system and simulation analysis of ocular behavior, including optical correction, in order to optimize optical compensation solutions.

C2 Conducting the testing of the optometric behavior, the approach of some specific global problems, on the process of vision in which the living conditions are taken into account.

C3 Knowledge of advanced design and analysis techniques of optometric equipment using the electronic computer and automatic calculation techniques.

C4 Applicative competencies regarding the perception of movement in differentiated environmental conditions

and the perception of space in mono- and binocular vision situations.

C4 Applicative competencies regarding the perception of movement in differentiated environmental conditions and the perception of space in mono- and binocular vision situations.

Figure 5. Testing of the optometric behavior

Figure 6. Analysis techniques of optometric equipment

C4 Applicative competencies regarding the perception of movement in differentiated environmental conditions and the perception of space in mono- and binocular vision situations.

C5 Competent for legislative aspects relating to the placing on the market of optical equipment for medical and optometric use as well as their implications in the verification of specific standards, including aspects of optical metrology.

C6 Competences regarding the ability to act independently and creatively in addressing and solving problems, competencies regarding the capacity of analysis and synthesis.

CT1 Fulfillment of professional tasks with an exact identification of the objectives to be achieved, of some potential risk factors, of the available resources, of the economic and financial aspects, of the conditions for their completion, of the working stages, of the working time, and of the related deadlines for achievement.

CT2 Responsible execution of multidisciplinary teamwork tasks, assuming roles on different hierarchical levels.

CT3 Identifying the need for in-service training and the efficient use of informational sources and resources for communication and assisted professional training (Internet portals, specialized software applications, databases, online courses, etc.) both in Romanian language and in an international language.

These competencies are split into knowledge and abilities. The pieces of knowledge are:

1. In-depth knowledge of an area of specialization and, within it, of the theoretical, methodological, and practical developments specific to the program; proper use of specific language in communication with different professional environments
2. Using specialized knowledge to explain and interpret new situations in wider contexts associated with the field

The abilities are:

1. Integrated use of the conceptual and methodological apparatus, under conditions of incomplete information, to solve new theoretical and practical problems
2. Nuanced and relevant use of evaluation criteria and methods to formulate value judgments and substantiate constructive decisions
3. Elaboration of professional and/or research projects, innovatively using a wide range of quantitative and qualitative methods

At the final exam the students have to fulfill the minimum performance standards for competence:

- Realization of applications using advanced knowledge for computer-aided modeling of the visual system and analysis by simulation of ocular behavior;
- Carrying out technical, execution, and maintenance projects for complex optomechanical systems through the correct use of the specific models of the field.
- Realization of applications regarding the design, execution, and maintenance of optical systems, used in optometry cabinets.
- Realization of applications regarding the design, execution, and maintenance of components, subsystems, and optomechanical systems.
- Realization of applications regarding the design, execution, and maintenance of optical subsystems. Legislative aspects relating to the placing on the market of optical equipment for medical and optometric use.
- Realization of technical, execution, and maintenance projects for complex optomechanical systems with the integration of component subsystems.

Conclusions

There are research plans at the level of the faculty of the programs in the field of optometry, which include research topics relevant to the field of master's degree studies and through the policy pursued at the level of the department director, dean, and rector, from the point of view of scientific research, the following can be stated:

1. The advanced optometry master study program operates within the Department of Mechatronics and Precision Mechanics, which includes the Research and Development Center for Mechatronics.
2. A medium and long-term strategy was designed with an application for projects financed by national and international funds, managing to access several projects.
3. Another concern is the performance of contracts with third parties.
4. The financing obtained through national and international programs allowed the development of their own research base by purchasing new equipment to complete the existing material base.
5. The team of the Department of Mechatronics and Precision Mechanics which organize the Advanced Optometry master program, consists of 3 professors, 4 associate professors, 9 lecturers, 4 Ph.D. students with frequency, possesses the necessary capacity to achieve the proposed research objectives;
6. The results of the research are materialized in participation in national and international conferences, symposiums, congresses, publication of monographs and books, etc.

The activities carried out within the master's degree programs contribute to the orientation towards the employment environment of the students and in the spirit of dissemination of the scientific results.

Based on the above, it can be stated that the scientific research activity knows an upward dynamic within the University Politehnica of Bucharest, the involvement of teachers and students included in master's study programs can be quantified, from the point of view of performance indicators as follows:

- At the level of the University Politehnica of Bucharest, the priority directions of scientific research have been defined, which also includes the master's degree program Advanced Optometry.
- The students of the master's degree programs are included in the research activities carried out in the projects carried out at the Department of Mechatronics and Precision Mechanics, through the Research and Development Center for Mechatronics.
- The research results are capitalized by publishing books, monographs, articles, etc.

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