

## TRENDS IN MEDICAL TECHNOLOGY AND BME EDUCATION

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Advances in biomedical research and the resulting development of new diagnostic and therapeutic methods, techniques and equipment, has led to a radical change in the way health care is delivered today. Medicine is today strongly dependent on technology and some medical specialties have emerged from these technological advances. Advanced health procedures are more and more carried out by teams, rather than individual medical specialists. Biomedical engineers (BMEs) are the driving force in this extraordinary evolution. The universe of Medical Devices (MDs) includes today thousands of organisations: R&D Institutions, Manufacturers, Suppliers, Competent Authorities and Notified bodies, National and regional health authorities and decision centres, health units, Universities and other Educational institutions, etc. In fifty years the use of MDs has changed radically and their life cycle has been reduced dramatically. The introduction of single use devices led to millions of such devices to be consumed every day worldwide. New technologies are continuously being developed and implemented in fields like robotics, e-health, implantable devices, nanotechnologies. The global MD market is estimated to be more than 300 Billion Euros in year 2016, with more than 500,000 medical technologies registered [1]. Mobile applications are proliferating and the data generated are of the order of thousands of terabytes per day. New specialities emerged to analyse this tremendous amount of data and transform it to useful information.

The labor market for biomedical engineers is also rapidly expanding including new opportunities in research institutes and universities, the Medical Devices (MDs) industry and health care systems. Education of biomedical engineers is following these developments in a parallel rapid expansion. A survey carried out in 2012 within the CRH-BME Project revealed over 350 BME study programs in Europe, with the 2<sup>nd</sup> cycle (MSc level) programs dominating. The 70% of the BME programs have been created after the year 2000, while new programs are constantly being added to the list [2]. More than 150 Universities across Europe offer a total of about 350 BME programs, 55% of which are MSc and 20% are PhD. As it was expected, the programs also offer more specializations, given the increased complexity of the R&D where BMEs are involved [3]. Biomedical Engineering as a profession is not only expanding but also changing in order to be adapted to the new needs and trends. Biomedical Engineers (BMEs) today must possess a sound and broad knowledge of fundamental engineering and physical science and additionally be able to apply this knowledge and skills to solve very diverse problems of medical and biological origin, which all require a multidisciplinary approach. BME education, lifelong learning and training, should provide this knowledge and skills, by continuously adapting their programs to the new developments and needs.

Within the current research programs in Europe, under FP7, health is the major theme. The objective of health research is to improve the health of European citizens and boost the competitiveness of health-related industries and businesses. Biomedical engineering is essential in this process. In order to meet recent and future developments and the R&D progress in BME, and also to respond to the BME job market demands, Universities in Europe must continue to adapt and expand their BME study programs in new areas.

[1] The European Medical Technology Industry in figures <http://www.medtecheurope.org>

[2] Bliznakov Z, Pallikarakis N, "Review of the Biomedical Engineering education programs in Europe within the framework of TEMPUS IV, CRHBME project", in IFMBE Proc. 29, pp 979-82 2010

[3] Magjarevic R, Lackovic I, Bliznakov Z, Pallikarakis N. "Challenges of the biomedical engineering education in Europe" Conf Proc IEEE Eng Med Biol Soc.1:2959-62 2010