

REVIEW

For the educational program 8D05301 – “Applied and Engineering Physics”

The current stage of scientific and technological development emphasizes the growing role of physics as a foundation for cutting-edge innovations. The transition to a knowledge-driven and technology-oriented economy requires the preparation of highly qualified specialists capable of integrating fundamental physical principles with advanced research methods to address complex scientific and engineering challenges. The field of Applied and Engineering Physics at the doctoral level represents a multidisciplinary area that combines advanced scientific research, experimental techniques, and engineering approaches for the development and practical implementation of novel physical technologies.

Innovations in this field are closely linked to the creation and application of modern physical methods and technologies, including nanomaterials, quantum and photonic devices, sensor systems, laser and plasma technologies, energy-efficient solutions, and advanced diagnostic instrumentation. These areas are essential for the advancement of high-tech infrastructure in industry, medicine, energy, and information technologies.

The educational program 8D05301 – “Applied and Engineering Physics” was developed by the Department of Materials Science, Nanotechnology, and Engineering Physics at Satbayev University. The aim of the program is to train doctoral students who possess profound fundamental knowledge in physics, along with advanced research, experimental, and analytical skills. The program emphasizes the development of competencies required for conducting independent research, designing novel physical systems, and contributing to scientific and technological innovation.

The curriculum includes a combination of foundational and advanced specialized courses aimed at enhancing systematic scientific thinking, research methodology, and technical expertise. Foundational courses focus on modern experimental methods, data analysis, computational modeling, and the interpretation of complex physical phenomena.

Specialized courses provide in-depth training in contemporary areas of applied physics, including semiconductor physics, nanostructures, photonics, sensor technologies, and materials science. Additionally, doctoral students gain proficiency in advanced computational methods, instrumental analysis, and modern laboratory techniques, as well as research project management and innovation-driven engineering practice.

The program emphasizes the development of independent research and analytical skills, enabling doctoral students to design, implement, and optimize physical technologies across diverse sectors such as industry, energy, environmental protection, information technologies, and biomedical applications. By combining fundamental knowledge with experimental expertise and innovative thinking, graduates are prepared to lead high-level research projects and contribute to scientific advancements on a global scale.

The presented educational program 8D05301 – “Applied and Engineering Physics” is of significant importance for training future research leaders in physics and engineering, and it is recommended for approval.

Reviewer by Dr. Nur Nabihah Yusof:

The educational program 8D05301 “Applied and Engineering Physics” is thoughtfully constructed and clearly articulates its relevance to current scientific and technological development. The description effectively highlights the increasing importance of physics as a foundation for modern innovation and emphasizes the interdisciplinary nature of the field. The program demonstrates a strong vision by combining fundamental physical principles with advanced research methods.

Nevertheless, several aspects could be improved to strengthen the clarity, practical orientation, and alignment of the program with international standards. First, while the program outlines broad competencies, it would benefit from more explicit and measurable learning outcomes. Specifying expected abilities such as analyzing complex data, designing experimental systems, or conducting advanced computational modelling would make the learning outcome clearer to the students and evaluators.

While the program mentions several potential application areas, including industry, energy, and biomedical technologies, incorporating more specific examples would make the relevance of the program more visible. Adding references to areas such as photonics for environmental monitoring, nanomaterials for renewable energy, or sensors for biomedical diagnostics would illustrate the program’s practical scope.

Overall, the program has potential with a clear vision and solid academic foundation. With improvements in defining learning outcomes, detailing the course structure, and providing concrete examples of application areas, the document would better reflect international best practices and further strengthen its position as a leading doctoral program in applied and engineering physics.



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